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A revision of the genus *Arbelodes* Karsch (Lepidoptera: Cossoidea: Metarbelidae) from southeast-central and southern Africa with the description of thirteen new species

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ABSTRACT

The genus *Arbelodes* Karsch (1896) is presented, currently comprising 22 species, from southeast-central and southern Africa. This genus is found to be centred in southern Africa, with the highest diversities and endemism in montane zones as in the Great Escarpment-Drakensberg (South Africa and Lesotho), the Cape Floristic Region and in southern Namibia. It is closely linked to a warm temperate vegetation element, related to Afromontane forest and to a subtropical thicket with succulent components. The latter is associated with an ancient, dry subtropical forest and/or woodland vegetation; the former with mixed gymnosperm-angiosperm forests of the mid Cretaceous. Based on morphological characters, no close relationship has been found to any of the other genera of Metarbelidae occurring predominantly in tropical Africa. According to these results *Arbelodes* is treated herein as a potential relict of Gondwana or the Cretaceous. Thirteen new species are described. Presented are photographs of the adults, illustrations of their wing venation and genitalia; as well as information on the floristic composition of their habitats. The type species of the genus is *Arbelodes meridialis* Karsch (1896), which has a south-easterly distribution in South Africa, and occurs in three adjacent phytochoria with a possible centre in the *"Tongaland-Pondoland regional mosaic"*. Six species, namely *Teragra sticticosta* Hampson (1910); *Metarbela albitorquata* Hampson (1910); *M. flavicolor* Janse (1925); *M.griseata* Janse (1925); *M. iridescens* Janse (1925) and *M. heringi* Janse (1930) have been transferred from the genera *Teragra* Walker (1855) and *Metarbela* Holland (1893) into the genus *Arbelodes*. The majority of these species are linked to the Great Escarpment-Drakensberg. The remaining species include: *Arbelodes claudiae* spec. nov. from Mbala (northeastern Zambia), Mzuzu and the *Juniperus* forest (northern Malawi); *A. prochesi* spec. nov. from Kalomo (southeastern Zambia) and the Vumba Highlands (eastern Zimbabwe); *A. collaris* Aurivillius (1921) from the Limpopo Province (South Africa); *A. deprinsi* spec. nov. from Dragon Peaks Mountain Resort (KwaZulu-Natal Province); *A. mondeensis* spec. nov. from Kleinemonde (Eastern Cape Province); *A. dicksoni* spec. nov. from Cape Town; *A. varii* spec. nov. from Bloubergstrand (Western Cape Province); *A. agassizi* spec. nov., *A. franziskae* spec. nov., *A. haberlandorum* spec. nov., *A. kruegeri* spec. nov. and *A. shimonii* spec. nov. from the Cederberg mountain range (Western Cape Province); *A. dupreezi* spec. nov. from Farm Aar (southwestern Namibia) and *A. sebelensis* spec. nov. from Sebele (southeastern Botswana).

Keywords: Southern Africa, genus *Arbelodes*, revision, new species, taxonomy, distribution.

INTRODUCTION

There has been no treatment of the Metarbelidae of the Afrotropical Region since the monograph of Janse (1925) for South Africa and the publication by Gaede (1929). Between 1930 and 1977 less than ten new species had been described. Six new species from the Afrotropical Region were described by Lehmann (1997; 2007) and one species by Mey (2005). Whereas sixteen new species, including the newly recorded genus *Paralebedella* Strand (1923), from Kenya, Tanzania and Uganda

have subsequently been added (Lehmann, 2008a, b). The new genus *Kroonia,* including seven new species, from the Afrotropical Region has been described by Lehmann (2010). The characters which define the Metarbelidae, and the current knowledge about the adult Metarbelid moths, their distribution in the Afrotropical and Oriental Regions, their immature stages and habitats were dealt with by Lehmann (2008a, b; 2010).

Janse (1925) treated the genera *Metarbela* Holland (1893) and *Arbelodes* Karsch (1896) as the same genus, the former having priority. In contrast, Karsch (1896), Aurivillius (1901), Gaede (1929) and Vári *et al.* (2002) treated *Arbelodes* and *Metarbela* as different genera. Lehmann (2007) adopted this view and additionally, treated *Arbelodes* as an endemic genus of southern Africa, with the description of one new species, namely *A. kroonae* from southeastern Namibia. The following paper gives evidence, that *Arbelodes* is a genus on its own and is predominantly centred in the montane zones of southern Africa with highest diversities of endemic species in the Great Escarpment-Drakensberg, Cape Floristic Region and in mountainous areas of southern Namibia. A minor extension exists via the Eastern Highlands of Zimbabwe to plateau areas of Malawi with a disjunct distribution on plateau regions of eastern Zambia.

At this stage it is impossible to give a detailed description of the distribution, diversity, endemism as well as about the habitats of all the *Arbelodes* species, but it is worthwhile to try and fit the available data into a model (it is presented in the discussion below), which can be modified or rejected as new evidence becomes available. Some scientists may consider it too early to undertake this exercise here and prefer to look for more data. In science there is room for both the analytical and the synthetic approach as long as the evidence we use is scrutinized and weighed with care.

MATERIAL AND METHODS

Approximately 1350 specimens representing *ca.* 255 species will be examined during the present study, from the collections of The Natural History Museum, London, UK (BMNH); the Natural History Museum, Paris, France (MNHN); the private owned Museum Witt, Munich, Germany (MWM); the Natural History Museum, University of Oslo, Norway (NHMO); the National Museums of Kenya, Nairobi (NMK); the Swedish Natural History Museum, Stockholm (NRM); the Royal Museum for Central Africa, Tervuren, Belgium (RMCA) including specimens collected in Kenya by Jurate De Prins and Ugo Dall'Asta in 1998-2009; the Senckenberg Research Institute and Museum, Frankfurt/Main, Germany (SMF); the Zoological Museum Amsterdam, The Netherlands (ZMA); the Zoological Research Institute and Museum Alexander Koenig, Bonn, Germany (ZFMK); the Natural History Museum, Humboldt-University, Berlin, Germany (ZMHB); the Zoological Museum, University of Copenhagen, Denmark (ZMUC); the Zoological State Collection Munich, Germany (ZSM); including 40 species and digital images of all the species of Metarbelidae housed in the Transvaal Museum of South Africa, Pretoria (TMSA), and also specimens from the private collection of Dr Douglas Kroon (Sasolburg) and Hermann Staude (Magaliesburg). Additionally, privately owned specimens include 23 species from northwestern Tanzania collected by the late Jan Kielland and Anders Bjørnstad (Skien, Norway) and 55 species from northern, central and southern Malawi collected by Raymond James Murphy (Mzuzu) in 1996-2010.

A photograph of each species was taken prior to dissection. The descriptive colour terms of each specimen (*e.g.* of the head, thorax, abdomen, wings) were described before dissection in daylight and are based on terms used in *Color Standards and Color Nomenclature* (Ridgway, 1912). Regarding the genitalia, the author concentrated on the male genitalia, and female postabdominal structures were examined in far fewer than 100 specimens. A drawing of the genitalia was made immediately after dissection. The nomenclature for parts of the head, antennae, thorax, abdomen, legs and venation follows Scoble (1995) and for internal features, mainly the genitalia, Sibatani *et al.* (1954) and Klots (1970). The terminology of the external and internal features at generic level is in accordance with Janse (1925).

"Southern Africa", as treated in this paper, includes the entire areas of Namibia, Botswana, South Africa, Lesotho and Swaziland based on Goldblatt (1978). The geographical names follow Giess (1971), Sayer *et al.* (1992), White *et. al.* (2001), and Mucina & Rutherford (2006).

The comparison of the diversity and distribution patterns of Metarbelidae species with habitats can be best examined based on White's (1983) detailed work which describes the vegetation types of Africa, discerning eighteen phytogeographical

regions and transition zones (phytochoria) based on richness of their endemic floras at the species level. For practical reasons, Van Wyk & Smith (2001) extended the border of White's Tongaland-Pondoland region, *e.g.*, westwards to include those parts of the Afromontane Region lying below the Great Escarpment-Drakensberg (below 1800 m) in KwaZulu-Natal and the northern parts of the Eastern Cape. Some of White's transition zones, in regard to southern Africa, have obscured their status as a centre of endemism in its own right. These centres of endemism were treated separately by Van Wyk & Smith (2001). For example, Van Wyk & Smith's *"Maputaland-Pondoland Region"* is roughly congruent with the *"Tongaland-Pondoland regional mosaic"* of White. The Maputaland Centre, as part of the Maputaland-Pondoland Region, is acknowledged as one of the important centres of plant endemism. Due to these changes, White's as well as Van Wyk & Smith's biogeographical approaches were mentioned in this paper. The very detailed vegetation units that are presented here for South Africa follow Mucina & Rutherford (2006). These vegetation units are based on recent biome classifications which show a fair correspondence to White's (1983) phytochoria.

TAXONOMIC REVIEW

Arbelodes Karsch, 1896

Type species: *Arbelodes meridialis* Karsch, 1896

Diagnosis: *Arbelodes* has the typical characters that define the Metarbelidae. These were summarized by Lehmann (2008a) and are therefore not repeated here. Karsch (1896) separated the genera *Arbelodes* and *Metarbela* due to one difference, namely that the base of vein Sc+R_1 crosses the base of the upper median of the cell (character 8 below). He described an "anastomosis of vein C for a short distance with the upper median" (translated from German to English). Seven characters (numbered 1-7) were found by the author that are diagnostic for *Arbelodes* when compared to other genera of the Metarbelidae:

1) Valvae with a broad base and two or three narrow lobes, usually of different length; the dorsal lobe is very long, stick-like, extending to near tip of uncus, tip rounded; shortest lobe thorn-like.
2) A broad structure sometimes occurs below the base of the dorsal lobe, probably a valval apodeme, which when viewed laterally, has a rounded tip. Behind the broad structure is often a large plate, which when viewed ventrally, is almost rectangular in shape.
3) The aedeagus is long and simple, tube-like.
4) Abdominal segment 9 in the female has very short, sometimes extremely small and probably rudimentary, anterior apophyses.
5) The posterior apophyses have a very broad and elongated shape; their size is usually extremely large.
6) The male antennae are very long, at least half the length of the forewing (antenna-wing ratio of at least 0.50:1). The long, narrow branches are densely scaled dorsally and have at least five times the width of the shaft; shaft always densely scaled.
7) In the forewing, the end of the upper half of the cell is always open in both sexes.
8) In the hindwing, the base of vein Sc+R_1 always crosses the base of the upper median of the cell in both sexes.

Defining characters of *Arbelodes* (apomorphies):

1) In the forewing, the end of the upper half of the cell is always open in both sexes.
2) In the hindwing, the base of vein Sc+R_1 always crosses the base of the upper median of the cell in both sexes.
3) The male antennae are very long, at least half the length of the forewing (antenna-wing ratio of at least 0.50:1), with long branches, never club-like in shape, at least five times the width of the shaft.
4) The valvae comprise two or three, long and narrow lobes.
5) In the postabdominal structure of the female the anterior apophyses are very short or rudimentary; less than 60% of the length of the posterior apophyses. The latter are very broad and large.

Description

Adult: Head often small, rough-scaled, a pair of small pits on the lower part of frontoclypeus is absent, but a pair of large, deep, oval-shaped pits occurs behind the labial palpi; male antennae bipectinate, female antennae unipectinate (based only on the currently known females), flagellum and dorsal side of branches are densely scaled (the scales on the short branches are absent in some females). The thorax often has a collar ring and is very hairy. Abdomen with dense hairs, abdominal tuft present, long and often resembling a swallow-tail. Femora, tibiae and tarsi are covered with dense, long hairs; tarsi often densely scaled. Hindlegs are with two pairs of narrow tibial spurs in both sexes which are long (at least 0.9 mm). The whole underside of fore- and hindwing are rough-scaled in both sexes. Frenulum absent. An outstanding feature of several species is a geometric design (= triangular-like and/or rectangular-like patches, a T-like and/or leaf-like pattern), sometimes colourful, on the forewing upperside of the male (*e.g.*, *A. albitorquata*; *A. deprinsi* spec. nov.; *A. shimonii* spec. nov.), combined with a strong, silvery, pure white or vinaceous gloss (a strong silvery glint is extremely rare among the Metarbelidae). Noteworthy is also a geometric design on the hindwing upperside in the male of *A. albitorquata* (large triangles along the termen). Very rare colours among the Metarbelidae are orange-buff and orange-yellow. Both colours occur in *A. flavicolor* (a broad black band along the termen which is suddenly separated by light orange-yellow on the hindwing), and in *A. mondeensis* spec. nov. (orange-buff spots on the forewing upperside).

Male genitalia: Saccus long, rudimentary or absent; uncus broad, very long or short, triangular-shaped with a broader base; always bifid. The valvae comprise two or three lobes, of which the dorsal lobe is usually the longest. A prominent short structure, probably a valval apodeme, is present near the base of the dorsal lobe in some species. It often occurs with a large, broad plate below the anus. Juxta elongated; at the upper end with two acuminate lobes and an emargination. Aedeagus simple, narrow and almost as long as the width of the dorsal lobe of the valva, sometimes short and broad, at the ends rounded or with a swallow-tail distally; vesica without cornuti.

Note: A damaged and very faded male (ex MWM, gen. no. 25/062010 I. Lehmann) of an unknown species from north-central Namibia (Waterberg Plateau) has a similar genitalia to *A. griseata* Janse (1925), but was excluded here since two apomorphies are absent: Firstly because $Sc+R_1$ does not cross the base of the upper median of the cell, but comes out at half the upper median; secondly, the antenna-wing ratio is of only 0.42:1. If further specimens are found with the same characters, this new species most probably represents a new genus.

Female postabdominal structure: segment 9 has never a wave-like dorsal surface. Along the posterior edge of segment 9 long setae are scattered from the top to the ventral part or only at the ventral part, where they become denser. The posterior apophyses are very large and broad, but the anterior apophyses are narrow, very short and sometimes rudimentary. This feature is absent in all other known genera. Papillae anales obliquely 8-shaped, densely covered with long and short setae.

Composition: at present, there are 22 known species of *Arbelodes* including the type species. Thirteen new species are described here, and six species, namely *Teragra sticticosta* Hampson (1910), *Metarbela albitorquata* Hampson (1910), *M. flavicolor* Janse (1925), *M. griseata* Janse (1925), *M. iridescens* Janse (1925) and *M. heringi* Janse (1930), have been transferred from the genera *Teragra* Walker (1855) and *Metarbela* Holland (1893) into the genus *Arbelodes* because they have the defining characters mentioned above.

Ecology: The genus *Arbelodes* is linked to a warm temperate and/or subtropical southern African forest, woodland and thicket flora with a succulent component. Only a few species have been recorded from lowland areas in South Africa (*e.g.*, Durban, Kleinemonde and Port Elizabeth). Hence, it is predominantly a genus of submontane and montane zones, mainly located in the Afromontane Region *sensu* White (1983). A strong link has been found to the following vegetation types: Firstly, the southern African temperate forests, related to Afromontane types, in which the genus *Podocarpus* and other non-woody legume genera are dominant. Secondly, floristically rich semi-arid to subhumid southern African subtropical thickets and/or shrublands with succulent components, often embedded in a grassland matrix. Thirdly, karroid grasslands and to the flora of the Succulent Karoo. To a minor extent the *Arbelodes* species occur in submontane and montane zones with the following vegetation types: Firstly, wetter or drier, legume-dominated woodlands, including tropical miombo genera, but also chipya with relicts of evergreen forests. Secondly, subtropical, higher-lying savanna-grasslands. Thirdly, forest relicts dominated by *Juniperus procera* Hochst. & Endl., which represents a northern temperate element.

Distribution: Centred on southern Africa, comprising the countries South Africa, Lesotho, Swaziland, Botswana and Namibia. The majority of the species are endemic in particular to central and southern Namibia, or to South Africa, with highest diversities in the Cape Floristic Region as well as on the Great Escarpment-Drakensberg. The distribution extends from around Windhoek in the northwest further south to Cape Town, and from there further northeast, via mountainous areas, to the Great Escarpment-Drakensberg. Lower-lying habitats, often in a submontane zone, belong to the provinces Western Cape, Eastern Cape, Mpumalanga, Gauteng and Limpopo. Only a few records exist from the Indian Ocean coastline (Durban, Kleinemonde and Port Elizabeth). The genus occurs certainly in the Lesotho Highlands and in the western half of Swaziland. A minor and patchy distribution has been found north of the Limpopo River, namely in the Eastern Highlands of Zimbabwe, and on higher-lying areas of northern Malawi, including a disjunct distribution centred on plateau areas of eastern Zambia. Mbala (formerly called Abercorn) is the northernmost distribution limit of the genus *Arbelodes* at present. The genus is unknown on the Arabian Peninsula and on Madagascar.

REVIEW OF SPECIES

1. Type species: *Arbelodes meridialis* Karsch

Plate 1, figures 1, 2; figures 1a, b; 2 a, b

Original combination: *Arbelodes meridialis* Karsch, 1896

Synonyms: *Arbelodes meridionalis* Karsch, 1896, in von Dalla Torre & Strand (1923)

Material examined:

Holotype male, South Africa (= S.A.), Cape, no locality, no date, S. Bachmann leg., ex ZMHB (deposited in ZMHB).

Female, S.A., Natal, no locality and no date, ? G. Mssu. leg., ex ZMHB, genitalia slide number 20/012010 I. Lehmann (deposited in the ZMHB); female, S.A., Orange Free State, Oranjekrag, H.F. Verwoerd Dam, 9.-17.January.1969, Snyman & Snydom leg., ex TMSA, genitalia slide number 16/032010 I. Lehmann (deposited in TMSA); male, S.A., Eastern Cape, Grahamstown, no date, ? Renzel leg., ex BMNH, Joicey collection, B.M. 1925-175, abdomen missing, (deposited in the BMNH); male, S.A., Eastern Cape, Steynsburg, 13.-27.March.1965, R.J. Southy leg., ex TMSA, genitalia slide number 22/022010 I. Lehmann (deposited in the TMSA).

Description of the male (ex Steynsburg)

Forewing length 12.0 mm; antenna-wing ratio 0.50:1.

Head: rough-scaled, light yellowish olive hairs with smoke grey tips around eyes and base of antennae, eyes ecru-olive with small black spots; antennae long, bipectinate, flagellum with smoke grey scales, branches of antennae six times width of shaft, narrow, covered with smoke grey scales dorsally, branches not bent towards tip of antenna, covered with hairs in pairs ventrally up to the base of branch, distance between branches one time width of branch; labial palpi short, less than half diameter of eye and covered with light yellowish olive scales which have tips of light brownish olive. **Thorax**: patagia and tegulae light yellowish olive, scales with light brownish olive tips; a small crest of light yellowish olive mixed with pure white scales on metathorax. **Abdomen**: mainly colonial buff with ivory yellow hairs. **Legs**: femora, tibiae and tarsi are densely covered with long colonial buff hairs; two pairs of tibial spurs present on hindlegs, narrow, 1.2 mm long, inner spur shorter, the lower pair 1.0 mm long, overlapping the first tarsal joint. **Forewing**: upperside with light yellowish olive ground-colour; spots of light brownish olive on a drab-grey ground-colour at the costal margin; a prominent postmedial band of light brownish olive with longer and shorter striae; below 1A+2A three larger and three smaller pure white patches edged light brownish olive; cilia 1.1 mm long, alternating pure white and light yellowish olive. Underside rough-scaled, ecru-olive. **Venation**: cell less than half length of the wing, 1A+2A forked at base, CuP obsolete, CuA_2 from almost two thirds of lower median, CuA_1, M_3 and M_2 separated from lower angle, M_1 from upper angle, which is open towards termen; R_3 from upper angle of areole; R_5+R_4 on a short stalk from upper angle of areole; R_2 from top of areole; R_1 from upper angle; Sc more or less parallel to R_1; areole protruding slightly from upper angle; discocellular angled inwardly, lower angle slightly shorter than upper one, veinlet in cell present but towards base obsolete. **Hindwing**: upperside with buffy olive ground-colour; cilia

and underside as in forewing; frenulum absent. **Venation**: cell less than half length of the wing; 3A and 1A+2A present, CuP absent; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs are on a long stalk and arise from upper angle; no bar to $Sc+R_1$; base of $Sc+R_1$ crossing base of the upper median of the cell; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present but towards base obsolete. **Genitalia**: saccus broad, long, one third of width of valva, rounded towards tip; tegumen and vinculum fused, forming a firm broad ring with a ring-like structure, which is not open at centre, at base behind the valvae; valvae broad at base, two lobes present, lower lobe thorn-like and one-third the length of upper lobe which is stick-like with a rounded tip, covered with setae on the ventral side; costa without setae, the tip acuminate; sacculus narrow; uncus broad with a serrate edge and a broader base, bifid, tip rounded, setae present; below the base of the uncus on either side a few setae. A prominent large, broad plate above anus. Aedeagus simple, slightly longer than dorsal lobe of valva, with two ends resembling a swallow-tail; vesica without cornuti.

Description of the female (ex Natal, locality unknown)

Forewing length 12.5 mm; antenna-wing ratio 0.36:1.

Head: rough-scaled, colonial buff scales with warm sepia tips around eyes and base of antennae, eyes wood brown with black patches; antennae short, colonial buff, unipectinate, branches of antennae two times width of shaft, covered with minute hairs on all sides, hairs shorter than width of branch, tip of branch bifid, rounded towards tip, branches without scales, but flagellum with colonial buff scales; labial palpi colonial buff, half of eye diameter. **Thorax**: patagia with scales of colonial buff, towards tips warm sepia, and a white collar ring, tegulae colonial buff mixed with pure white scales; a small colonial buff coloured crest on metathorax. **Abdomen**: largely colonial buff. **Legs**: femora and tibiae with long colonial buff hairs, tarsi with colonial buff scales; two pairs of tibial spurs present on hindlegs, 1.2 mm long, inner spur shorter, the lower pair thicker, 1.0 mm long, overlapping the first tarsal joint. **Forewing**: upperside faded with an ecru-olive ground-colour; striae of light brownish olive along the costal margin; a broad "C-shaped" patch of chamois edged light brownish olive near base of wing; below the end of CuA_2 a large pure white patch towards the dorsum; a broad light brownish olive subterminal band from costa to the centre of CuA_1; cilia ecru-olive mixed with scales that have light brownish olive tips. Underside colonial buff, rough-scaled. **Venation**: cell almost half length of the wing. Vein 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median; CuA_2, CuA_1 and M_3 separated from lower angle; upper angle open towards termen, M_1 from upper angle; R_3 from upper angle of areole; R_5+R_4 on a short stalk from areole; R_2 from top of areole, R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, lower angle slightly longer than upper one, veinlet in cell present. **Hindwing**: upperside faded, probably ecru-olive, with a broad buffy olive band along termen; cilia and underside like in forewing; frenulum absent. **Venation**: cell less than half length of the wing; 3A and 1A+2A present, CuP obsolete; CuA_2 like in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs on a stalk and emerging from upper angle; no bar to $Sc+R_1$; the base of $Sc+R_1$ is crossing the base of upper median of cell; discocellular angled inwardly, upper angle slightly longer than lower angle, veinlet in cell present. **Genitalia**: abdominal segment 9 broad with a long and wide gap on the ventral side, this gap extends towards near base of anterior apophyses; along the posterior edge of segment 9 are very long setae from top to the ventral part where the setae become denser; posterior apophyses broad and one third longer than anterior apophyses; papillae anales broad, elliptic, obliquely 8-shaped towards top, covered with long and short setae, some parts without setae.

Diagnosis: *Arbelodes meridialis* is closely related to *A. sticticosta* Hampson (1910), on account of four common features (numbered 1, 2, 4, 5), while three features are unique to *A. meridialis* (numbered 3, 6, 7).

1) The saccus of *A. meridialis* is long and broad, one third of width of lower lobe, only longer in *A. sticticosta*.
2) The aedeagus is one of the longest in the genus *Arbelodes*, almost equal to the length from the end of saccus to the tip of the lower lobe, but narrow on its whole length. One end resembles a swallow-tail. The aedeagus is similar in shape, but much broader in *A. sticticosta*.
3) A peculiar feature in *A. meridialis* is the serrate edge of the broad uncus (viewed ventrally).

4) The antenna-wing ratio of the male antennae is in both species 0.50:1. A characteristic feature is that the branches are not strongly bent towards the tip of antenna like in other *Arbelodes* species, instead, the branches are almost vertical in *A. meridialis* and *A. sticticosta.*
5) A pair of small pits on the lower part of frontoclypeus is absent, but a pair of large and deep pits occurs behind the labial palpi in both species.
6) The female of *A. meridialis* has a prominent S-shaped anterior apophyses. This feature is absent in other currently known females.
7) The gap in segment 9, below the base of the anterior apophyses, is very long (like in other species), but narrow.

Habitat (examples): Steynsburg (Eastern Cape Province) is a small town *ca.* 90 km east of Middelburg. The flora of the Eastern Cape is a mixture of endemic, Sudano-Zambezian, Karoo-Namib, Afromontane, Tongaland-Pondoland and Cape species (Werger & Coetzee, 1978). Steynsburg (altitude 1464 m; average annual rainfall 350-450 mm; frosty winters are common) is located in the *"Kalahari-Highveld regional transition zone" sensu* White (1983), which is essentially grassland with a minor woody element mainly of Zambezian species, *e.g.*, *Acacia.* Only few endemics occur. Van Wyk & Smith (2001) excluded Steynsburg from the *"Albany Centre"* of plant endemism (*cf.* the pioneering study of Weimarck, 1941). It begins *ca.* 20 km further south. Hence, Steynsburg lies also just outside of the *"Maputaland-Pondoland-Albany Hotspot"* (Steenkamp *et al.*, 2004) which is a subtropical forest zone with many tropical forest elements and substantial temperate forest elements related to Afromontane forest. North of Steynsburg is a small area of *"Karoo Escarpment Grassland"* characterized by a few tall shrubs of *Rhus lucida* L. and *Diospyros austro-africana* De Winter. The vegetation type around Steynsburg is predominently *"Eastern Upper Karoo"* which is dominated by dwarf microphyllous shrubs, with ´white´ grasses of the genera *Aristida* and *Eragrostis*, both suggest a dry grassland. Due to this grass cover, the occurrence of *"southern African subtropical thicket vegetation"* can be excluded (*cf.* Cowling *et al.*, 2005). Important woody taxa of the *"Eastern Upper Karoo"* include tall shrubs like *Lycium cinereum* Thunb., *L. horridum* Thunb., and *L. oxycarpum* Dunal; low shrubs include *Eriocephalus ericoides* (L.f.) Druce, *E. spinescens* Burch. and endemics like *Selago persimilis* Hilliard and *Aspalathus acicularis* E. Mey. (Mucina *et al.*, 2006). *Aspalathus* is the largest genus among the Leguminosae in the Cape Region (Goldblatt, 1978). The descriptions above show a transitional character of the vegetation around Steynsburg.

Grahamstown (Eastern Cape Province) is located *ca.* 45 km north from the coastline of the Indian Ocean and between an exclave of the *"Cape regional centre of endemism" sensu* White (1983) to the east, north, west and to the *"Tongaland-Pondoland regional mosaic"* to the south. Grahamstown (altitude 539 m; average annual rainfall 697 mm) is surrounded by dissected hills and low mountains. Especially to the southwest occurs *"Bhisho Thornveld"* which is an open savanna characterized by small trees of *Acacia natalitia* E. Mey. and the tall shrub *Tephrosia capensis.* (Jacq.) Pers. The diversity of woody species increases under conditions of overgrazing (Rutherford *et al.*, 2006). Another vegetation type around Grahamstown is *"Suurberg Shale Fynbos"*. It is largely an ericoid shrubland that includes species of the *"Cape thickets"*. Important species are tall shrubs, *e.g.*, *Aspalathus setacea* Eckl. & Zeyh., *Protea lorifolia* (Salisb.) Fourc., *Diospyros dichrophylla* (Gand.) De Winter, *Rhus lucida* L. and low shrubs, *e.g., Erica thamnoides* E.G.H. Oliv. (Rebelo *et al.*, 2006). Southern African subtropical thicket vegetation occurs especially east of Grahamstown in a mosaic with grassland. Thicket elements include *Cussonia spicata* Thunb., *Diospyros dichrophylla* (Gand.) De Winter and *Rhus pallens* Eckl. & Zeyh. Fynbos elements of *Erica maesta* Bolus occur among the grassland (Cowling *et al.*, 2005).

Oranjekrag (today Gariep; Orange Free State) is located very close to the border of the Eastern Cape Province and is part of the *"Kalahari-Highveld regional transition zone" sensu* White (1983). The village Gariep (altitude 1231 m; average annual rainfall 441 mm at Bethulie, 40 km further east) is located east of Colesberg, *ca.* 5 km north from the Orange River, and at the Gariep Dam. This is the largest dam of South Africa, which was until October 1996 named for Hendrik Frensch Verwoerd. Gariep was established to facilitate the construction of the dam (opening in 1971). North and west of Gariep occurs *"Xharieb Karroid Grassland"* which is characterized by an open grassland intermingled with patches of dwarf karroid shrubs. Tall shrubs belong to *Rhus ciliata* Licht., low shrubs include for example *Lycium cinereum* Thunb. and *Chrysocoma ciliata* L. Southwest and south of Gariep occurs *"Besemkaree Koppies Shrubland"* which is dominated by small trees of

Cussonia paniculata Eckl. & Zeyh. and *Ziziphus mucronata* Willd., as well as grasses. Tall shrubs include *Diospyros austro-africana* De Winter, *Olea europaea* L. ssp. *africana* (Mill.) P.S. Green, *Rhus ciliata* Licht., and *Buddleja saligna* Willd. In consequence of the building of the dam, this vegetation type in particular has been lost in some areas (Mucina *et al.*, 2006).

One female specimen was collected in Natal (locality unknown). This is of interest here, since a similar shrubland type of the *"Besemkaree Koppies Shrubland"*, namely the *"Basotho Montane Shrubland" sensu* Mucina *et al.* (2006), occurs in KwaZulu-Natal on the Drakensberg foothills, and hence, this area is a potential habitat of *A. meridialis*.

Ecology: *A. meridialis* has specific habitat requirements. It occurs in temperate and subtropical grasslands which form a mosaic with woody species, indicating a higher moisture input, and which are located in submontane or montane zones. A characteristic feature are complex and transitional woody shrubland and/or thicket types which are linked to the Cape thickets (*"Suurberg Shale Fynbos"*); to the Nama-Karoo Grasslands (*e.g., "Besemkaree Koppies Shrubland");* possibly to the Drakensberg grasslands (*"Basotho Montane Shrubland"*) and to the Albany thickets (*"Groot Thicket"*). *A. meridialis* is not linked to grasses, but to woody shrublands and/or thickets, the latter include mainly species that developed during the Eocene.

Distribution: *A. meridialis* is currently known only from southeastern South Africa, namely from the Orange Free State, Eastern Cape and KwaZulu-Natal provinces. It will preliminarily classified as endemic to woody shrubland and thicket types occurring in these areas. Its distribution appears to be patchy and covers habitats that belong to various phytochoria, namely to the *"Kalahari-Highveld regional transition zone"*, the *"Cape regional centre of endemism"*, the *"Tongaland-Pondoland regional mosaic"* and perhaps also to the *"Afromontane archipelago-like regional centre of endemism"*. Janse (1925) mentioned only the type locality and hence, had not seen the species in the field. One specimen in the TMSA was collected in Aliwal North (Eastern Cape Province), which is *ca.* 110 km west from the border of Lesotho, indicating that *A. meridialis* might occur also in the Lesotho Highlands. Another specimen from the TMSA was recorded near or in Port Elizabeth (Eastern Cape Province), showing that it extends into lowland areas close to the Indian Ocean within the *"Albany Centre"* (Van Wyk & Smith, 2001).

2. Description of the remaining species

The description of the following 20 species has not been arranged in alphabetical order, rather according to pairs of more closely related species. Firstly, *A. sticticosta* (Hampson, 1910) with relations to *A. meridialis*; secondly, *A. flavicolor* (Janse, 1925); thirdly, *A. deprinsi* spec. nov. with relations to *A. albitorquata* (Hampson, 1910); fourthly, the pair *A. collaris* Aurivillius (1921) and *A. prochesi* spec. nov.; fifthly, the groups: *A. sebelensis* spec. nov., *A. claudiae* spec. nov. and *A. griseata* (Janse, 1925); *A. mondeensis* spec. nov.; *A. iridescens* (Janse, 1925) with relations to *A. haberlandorum* spec. nov.; *A. shimonii* spec. nov. with relations to *A. dicksoni* spec. nov.; *A. varii* spec. nov. and *A. franziskae* spec. nov; *A agassizi* spec. nov., *A. kruegeri* spec. nov., *A. heringi* (Janse, 1930) and *A. dupreezi* spec. nov.

The description of *Arbelodes kroonae* Lehmann (2007) from southern Namibia is not repeated here, but the paratype is figured on plate 5, figure 25. No further specimens of this species have been recorded among museum material.

Arbelodes sticticosta (Hampson, 1910), **comb. nov.**

Plate 1, figure 3; figures 3 a, b

Original combination: *Teragra sticticosta* Hampson, 1910

Synonyms: *Metarbela sticticosta* (Hampson, 1910), in Janse (1925)

Metarbelodes sticticosta (Hampson, 1910), in Vári *et al.* (2002).

Holotype: male, S.A., KwaZulu-Natal, Richmond, January.1905, Nicholson leg., deposited in BMNH (B.M. 1906-268).

Material examined: male, S.A., KwaZulu-Natal, Balgowan, 17.December.1951, K.M. Pennington leg., ex NMK, genitalia slide number 24/022010 I. Lehmann (deposited in NMK); male, S.A., Eastern Cape, St. Cuthberts, 06.December.1948, E.M. Gibson leg., ex BMNH, genitalia broken, genitalia slide number 15/022010 I. Lehmann (deposited in BMNH, genitalia slide number BMNH COSS 416).

Description of the male (ex Balgowan)

Forewing length 15.0 mm; antenna-wing ratio 0.50:1.

Head: rough-scaled, deep olive-buff hairs with a glint shine around eyes and base of antennae, eyes wood brown with small black patches; antennae pale olive-buff, bipectinate, branches of antennae six times width of shaft, narrow, covered with hairs in pairs on the whole length of branch and projecting inwards, tip of branch rounded with two thorn-like scales on top, only slightly bent towards tip of antenna, branches and flagellum with pale olive-buff scales; labial palpi thick, as long as diameter of eye and covered with deep olive-buff hairs which turn sepia towards tip. **Thorax**: patagia deep olive-buff with a faded collar-ring of pale olive-buff and a glint shine; tegulae deep olive-buff, glossy; a small crest of deep olive-buff with tips of sepia on metathorax. **Abdomen**: mainly deep olive-buff, mixed with colonial buff hairs. **Legs**: femora, tibiae and tarsi densely covered with long hairs of pale olive-buff, colonial buff at base; two pairs of tibial spurs present on hindlegs, upper pair narrow, 1.3 mm long, the lower pair with thick spurs, same length, overlapping the first tarsal joint. **Forewing**: upperside glossy, pale olive-buff, lunulated dots of deep olive-buff along the termen at the end of all veins; a dark olive-buff subterminal line, interrupted by the veins, and almost straight from near apex, only slightly bent towards tornus; postmedial band Natal brown, triangular at centre; spots along the costal margin of the same colour; a large rectangular patch of Natal brown below CuA_2, edged ivory-yellow and by a large white patch towards tornus; cilia 1.1 mm long, alternating deep olive-buff and white. Underside largely rough-scaled, glossy, deep olive-buff. **Venation**: cell more than half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated from lower angle; M_1 from upper angle; R_3 from top of areole; R_5+R_4 on a long stalk from top of areole; R_2 from areole; R_1 from upper median; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen, lower angle slightly shorter than upper one, veinlet in cell obsolete. **Hindwing**: upperside glossy, deep olive-buff; cilia like in forewing. Underside glossy, deep olive-buff; frenulum absent. **Venation**: cell less than half length of the wing; 3A present, 1A+2A forked at base, CuP absent; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs stalked and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present, a second, but obsolescent veinlet above. **Genitalia**: saccus very long, more than half width of lower lobe, rounded at tip (viewed ventrally); tegumen and vinculum fused, forming a firm ring which is very broad; a short appendage below saccus; valvae broad at base with two lobes, upper lobe long, narrow towards tip, which is rounded and covered with setae dorso-distally and ventrally; costa without setae, tip elongated, acuminate; lower lobe thorn-like, tip truncate with a skin-like appendage at inner side; in between these two lobes a short, broad and rounded structure, probably a valval apodeme; sacculus narrow; uncus with a broad base, with scattered setae from below the base on each side towards tegumen, uncus bifid, tips acuminate, with a few setae at tip. Aedeagus simple, very long, almost from end of saccus to tip of lower lobe, rounded basally, resembling a swallow-tail distally, with a deep emargination; vesica without cornuti.

Diagnosis: *A. sticticosta* has been transferred from the genus *Teragra* Walker (1855) to *Arbelodes* since it has the defining characters (apomorphies) of the latter genus. It is remarkable that both genera have a similar distribution, which is centred in southern Africa, but with *Teragra* extending far into tropical regions, *e.g.*, Kenya and Uganda. Morphological differences: the male antennae of the genus *Teragra* is characterized by short branches which are always club-like in shape (viewed ventrally or dorsally); all veins are very strong and the male genitalia has a beak-like uncus, whole shaped valvae, and a very narrow vinculum. These examples suggest, that both genera have to be treated separately and that *sticticosta* does not belong to the genus *Teragra*. The male of *A. sticticosta* has by far the longest saccus in the genus *Arbelodes*. This character of *A. sticticosta* resembles the saccus of the genus *Metarbela* Holland (1893), but the differences are stronger. For example, *A. sticticosta* cannot be included into *Metarbela* since the male genitalia of the latter genus never has lobes, or lobe-like valvae, and never a valval apodeme. Since Vári *et al.* (2002) treated *sticticosta* as a species of the genus *Metarbelodes* Strand (1909), it has to be stated here, that it is not related to this genus, which has, for example, very distinct male genitalia, namely an elongated, very large, bat-eared uncus, a hand-shaped scaphium below the anus and an extremely narrow tegumen and vinculum.

The closest related species of *A. sticticosta* is *A. meridialis* (*cf.* diagnosis above).

Habitat (examples): Firstly, Balgowan, *ca.* 10 km northwest from Howick (1121 m; 750-835 mm average rainfall) is located in the KwaZulu-Natal Province, *ca.* 25 km southeast of the small town Nottingham Road and belongs to the *"Afromontane archipelago-like regional centre of endemism" sensu* White (1983). Van Wyk & Smith (2001) included those areas of the Afromontane Region which are located below 1800 m, like Balgowan, into the *"Maputaland-Pondoland Region"*, which is an artificial rather than a natural unit. It is worth noting that this floristic region is the second-richest in endemics and near-endemics in southern Africa, including a high number of Leguminosae (90 species). Balgowan was included into the *"Maputaland-Pondoland-Albany Hotspot"* by Steenkamp *et al.* (2004). It is surrounded by an hilly landscape mainly associated with a discontinuous east-facing scarp formed by dolerite intrusions. The whole area belongs to the *"Midlands Mistbelt Grassland" sensu* Mucina *et al.* (2006), but only few patches of the original species-rich grassland remain. This grassland type includes extensive and smaller patches of *"Southern Mistbelt Forest" sensu* Mucina & Geldenhuys (2006). The latter are of importance here, since *A. sticticosta* is dependent on woody species and not on grasses. The forests are tall (15- 20 m) or have the character of a scrub forest. Important tree species include *Podocarpus falcatus* (Thunb.) R.Br., *Celtis africana* Burm. f., *Olea capensis* L. ssp. *macrocarpa* (C.H. Wright) I. Verd., *Podocarpus henkelii* Stapf, *P. latifolius* (Thunb.) R.Br. and *Cassipourea flanaganii* (Schinz) Alston. Two large forest patches near Nottingham Road, extending towards Balgowan, were mapped and described by Fourcade (1889), who mentioned that *Ptaeroxylon utile* Eckl. & Zeyh., a synonym of *P. obliquum* (Thunb.) Radlk., was "abundant" in these two forests, but they were heavily cut for firewood in the 1880's. Other common tree species include *Celtis africana* Burm. f., *Podocarpus latifolius* (Thunb.) R. Br., *P. elongatus* (Aiton) L'Herit. and *Scolopia mundii* (Eckl. & Zeyh.) Warb. Lawes *et al.* (2005) classified the Afrotemperate forests of the *"Balgowan complex"* (forest area: 130,5 km^2, occurring between 1000-1500 m; mean annual rainfall 1600 mm) as *"Eastern Mistbelt Forest"*, a subgroup of the *"Southern Mistbelt Forest"*. The Balgowan forests comprise few large patches (> 300 ha), but many small ones today (0,1-10 ha), which exist in their size at least since 1944. Hence, they are embedded in a stable and natural grassland matrix, since this matrix is older than 200 years. Dominant canopy tree species are those mentioned by Fourcade (1889), but additionally, *Xymalos monospora* (Harv.) Baill., *Calodendrum capense* (L.f.) Thunb., *Vepris lanceolata* (Lam.) G. Don and *Kiggelaria africana* L. were cited by Lawes *et al.* (2005). Important sub-canopy trees include, *e.g., Clausena anisata* (Willd.) Hook.f., *Diospyros whyteana* F. White and *Cryptocarya woodii* Engl.

Ken Pennington, who collected one of the specimens, probably at his home in Balgowan, lived on a small holding on the edge of a forested gulley, but higher up the slopes was a larger patch of indigenous forest. It was actually rather a mosaic of residual forested patches, with more extensive exotic pine plantations in the vicinity. The extensive Karkloof Forests are to the northeast, and are of the same type as the Balgowan forests. The former are protected and collecting there today is prohibited (D. Kroon, pers. comm.).

Secondly, Richmond (KwaZulu-Natal Province) is located *ca.* 45 km southeast of Balgowan and *ca.* 25 km south of Pietermaritzburg (721 m; 695 mm average rainfall). It is part of the *"Maputaland-Pondoland-Albany Hotspot"* which corresponds broadly to the delimitation of the *"Tongaland-Pondoland regional mosaic" sensu* White (1983). The area north of Richmond belongs to the *"Midlands Mistbelt Grassland"*, but more typical for its surroundings is *"Ngongoni Veld"*, a tall grassland dominated by wiry Ngongoni grass (*Aristida junciformis* Trin. & Rupr.). Fourcade (1889) showed that Richmond is located within large areas of *"thornbush"* dominated by various woody legumes. This thornbush occurs in a mosaic with the grassland belt. Rutherford *et al.* (2006) stated, that wooded areas (thornveld) are found in valleys at lower altitudes and on termitaria. Important tree species among the grassland include *Acacia natalitia* E. Mey., *A. nilotica* (L.) Willd., *A. sieberiana* DC. var. *woodii* (Burtt Davy) Keay & Brenan, but on termitaria different species occur, *e.g., Cussonia spicata* Thunb., *Ehretia rigida* (Thunb.) Druce and *Ziziphus mucronata* Willd.

Thirdly, St. Cuthberts is located in the Eastern Cape Province, *ca.* 30 km northwest from Mthatha (also called Umtata; 698 m; 654 mm average rainfall). It is, like Balgowan and Richmond, part of the *"Maputaland-Pondoland-Albany Hotspot"*. The surroundings of St. Cuthbert's represent a landscape which is moderately mountainous and characterized by extensive patches of *"Southern Mistbelt Forest" sensu* Mucina & Geldenhuys (2006) occurring in a mosaic with *"Drakensberg Foothill Moist Grassland" sensu* Mucina *et al.* (2006). The forests occur especially in the much incised river gorges where

also drier woody vegetation types can be found. Among the grassland occur small trees like *Encephalartos ghellinckii* Lem. as well as low woody shrubs such as *Chrysocoma ciliata* L. and *Rhus discolor* E. Mey.

Ecology: *A. sticticosta* will be classified as a temperate southern African forest and thicket species, which is mainly linked to the *"Afromontane archipelago-like regional centre of endemism"* and less to the *"Tongaland-Pondoland regional mosaic"* ***sensu*** White (1983). The latter was enlarged westwards by Van Wyk & Smith (2001) to include those parts of the Afromontane Region lying below the Great Escarpment-Drakensberg (< 1800 m) in KwaZulu-Natal and the northern Eastern Cape Province. *A. sticticosta* occurs in submontane and montane zones. It is linked to forest patches that are located among lightly-wooded grasslands, which are typical for the southern African Afromontane flora (and are perhaps a very ancient matrix), and which are located in areas where frequent mist provides an additional amount of moisture. The forests include temperate southern African forest elements like *Podocarpus* which is linked to the Afromontane Region and less to the Tongaland-Pondoland Region. The latter is largely a subtropical forest zone, with forests extending along the coast of the Indian Ocean from the Eastern Cape to the extreme southern parts of coastal Mozambique, suggesting that elements of a subtropical flora merge into the Afrotemperate forests. The subtropical coastal forests are related to the coastal forests of eastern Africa, which include species from West- and Central African rain forests. A closely related species of *A. sticticosta* that occurs in these tropical areas is not known. This fact supports the author's opinion that *A. sticticosta* is a temperate southern African element.

Distribution: *A. sticticosta* has a south-easterly distribution in South Africa and its range follows mainly the eastern side of the Great Escarpment-Drakensberg. The southern limit lies currently in the northern Eastern Cape Province (St. Cuthberts), from here *A. sticticosta* extends via KwaZulu-Natal to the Mpumalanga Province in the northeast. It occurs predominantly in the *"Afromontane archipelago-like regional centre of endemism"* and to a lesser extant in the *"Tongaland-Pondoland regional mosaic"*. Janse (1925) mentioned two other localities, namely Rietvlei (identity remains uncertain, presumptive to be in KwaZulu-Natal, *ca.* 40 km northeast of Balgowan) and Waterval Onder (Mpumalanga Province). The latter is characterized by *"Lydenburg Montane Grassland" sensu* Mucina *et al.* (2006) with an Afromontane flora including small forests and thickets. A specimen in the TMSA was collected in Sabie (Mpumalanga Province), *ca.* 85 km further northeast of Waterval Onder, among *"Northern Escarpment Dolomite Grassland" sensu* Mucina *et al.* (2006) that has a very diverse woody shrub layer. Sabie is currently the northern limit of the distribution of *A. sticticosta*.

It certainly occurs in the Lesotho Highlands, since a specimen in the TMSA was collected in the mountainous Golden Gate Highlands National Park (Orange Free State and close to Lesotho) which is characterized by *"Northern Drakensberg Highland Grassland" sensu* Mucina *et al.* (2006) with *Leucosidea sericea* Eckl. & Zeyh. shrublands and belts of *Protea subvestita* N.E. Br.

Arbelodes flavicolor (Janse, 1925), **comb. nov.**

Plate 1, figure 4; figures 4 a, b

Original combination: *Metarbela flavicolor* Janse, 1925

Synonyms: none.

Material examined: holotype male, S.A., KwaZulu-Natal, Impetyeni Forest, January.1921, Swinny leg., ex coll. Janse, deposited in TMSA (Type number 1116; genitalia slide number 387, Janse).

Description of the male (holotype)

Forewing length 14.0 mm; antenna-wing ratio 0.64:1.

Head: small, with a peculiar elongated shape resulting in some space in between eyes and base of antennae; rough-scaled, glossy, ivory yellow below, tilleul-buff around eyes as well as base of antennae, eyes black, densely edged with ivory yellow scales; a pair of small pits on lower part of frontoclypeus not seen, but a pair of large pits occurs behind the labial palpi; antennae bipectinate, densely scaled on shaft and dorsal side of branches with Saccardo's umber, branches of antennae seven times width of shaft, narrow, covered with hairs in pairs projecting inwards, tip of branch acuminate with one thorn-like scale, branches slightly S-shaped bent towards tip of antenna, distance between branches 1.5 times width of branch; labial

palpi longer than diameter of eye and covered with ivory yellow scales. **Thorax**: patagia and tegulae glossy, tilleul-buff; a small crest of light orange-yellow and tilleul-buff scales with tips of Prout's brown on metathorax. **Abdomen**: colourful; light orange-yellow dorsally, glossy and tilleul-buff ventrally. **Legs**: femora, tibiae and tarsi densely covered with scales of tilleul-buff, mixed with scattered hairs of ivory yellow; two pairs of tibial spurs present on hindlegs, upper pair longer, rather thick, 1.2 mm long, inner spur shorter, the lower pair 1.0 mm long, overlapping the first tarsal joint, both pairs glossy, densely covered with ivory yellow scales. **Forewing**: apex rounded; upperside Saccardo's umber with a few spots of Prout's brown along the costal margin and small patches of Prout's brown along the termen; a rounded spot of Prout's brown at the end of cell and a streak in the centre of the upper median; Prout's brown at base of M_1 and M_2; a line of the same colour from base of M_1 to inner margin, crossing M_3 and CuA_1 at centre; near base of wing and below lower median a pure white patch edged by two patches of Prout's brown, below half of CuA_2 a clay coloured patch edged white towards base of wing; cilia short, 0.5 mm long, Saccardo's umber. Underside rough-scaled towards base, colourful, a large light orange-yellow patch at centre, Prout's brown towards termen with a vinaceous gloss, costa glossy, tilleul-buff. **Venation**: cell half length of the wing; 1A+2A with a peculiar wave-like shape, forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated from lower angle; M_1 from upper angle; areole small; R_5+R_4+R_3 on a long stalk from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell present. **Hindwing**: colourful, upperside light orange-yellow at centre, a broad band of Prout's brown with a vinaceous gloss along termen; the edge opposite of the abdomen with long, light orange-yellow hairs. Cilia short, 0.7 mm long, light orange-yellow. Underside light orange-yellow at centre with the same coloured, but paler band along termen; frenulum absent. **Venation**: cell less than half length of the wing; 3A present, 1A+2A present, CuP rudimentary; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs on a long stalk and emerging from upper angle; below a very strong fold; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at almost half of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus small, rounded at tip; tegumen and vinculum fused, forming a firm ring which is very broad on its entire length; valvae broad at base, two lobes present, upper lobe relatively broad and not bent towards uncus, rounded at tip; lower lobe narrow, *ca.* half the length of upper lobe; a few long setae in between both lobes; sacculus narrow; uncus very broad, bifid, tips acuminate, setae not seen, a few tiny setae below the base on each side; juxta not seen. Aedeagus simple, tube-like, very long, as long as width of valva and vinculum, rounded basally, rounded and broader distally; vesica without cornuti.

Diagnosis: *A. flavicolor* has been transferred from the genus *Metarbela* Holland (1893) to *Arbelodes* (*cf.* diagnosis of genus). The male is outstanding: the hindwing is one of the most colourful among the Metarbelidae and its light orange-yellow has not been found in any other species. The small head with eyes that are edged ivory-yellow and the extremely long antennae give this species a very elegant appearance. A closely related species is currently unknown. The male genitalia appear to be diagnostic, however, since both lobes are probably not bent towards the uncus and no setae have been seen. In the other species at least the upper lobe is bent towards the uncus and covered with many setae. Additionally, *A. flavicolor* has a small saccus, which is either long, rudimentary or absent in the other species. Since the defining characters of *Arbelodes* occur, there is currently no reason to believe, that this species represents a new genus.

Habitat: Impetyeni Forest (also known as Impetyne Forest) is located in the *"Tongaland-Pondoland regional mosaic" sensu* White (1983), but very close to White's *"Afromontane archipelago-like regional centre of endemism"*, in KwaZulu-Natal Province, *ca.* 20 km southwest from Harding (899 m; 1100 mm average rainfall). Van Wyk & Smith (2001) included this area into the *"Maputaland-Pondoland Region"*. Much of Impetyeni Forest (mean altitude 1650 m; average annual rainfall unknown, but > 1100 mm) is facing to the south and clothes the sides of steep gorges at the head of the basin of the Umtamvuna River (also known as Umtanvunaz River), which has a very irregular shape. The forest comprised 752 ha in the year 1889, when the first farms were being rapidly taken up close to its area, but probably little was destroyed until present due to its location on steep gorges. The understorey was much destroyed by large troops of cattle that were driven into the upper parts of the forest in winter. The two dominant tree species are *Podocarpus latifolius* (Thunb.) R. Br. and *Ocotea bullata* (Burch.) Baill. Other common tree species include *Xylosma monospora* (Harv.) Baill., *Ptaeroxylon obliquum*

(Thunb.) Radlk., *Elaeodendron croceum* (Thunb.) DC., *Olinia cymosa* Thunb., *Olea laurifolia* Lam. and *Myrsine melanophleos* R.Br. Noteworthy is, that *Podocarpus elongatus* (Aiton) L'Herit. has not been found (Fourcade, 1889). The Impetyeni Forest can be classified as a *"Southern Mistbelt Forest" sensu* Mucina & Geldenhuys (2006) based on the two dominant tree species mentioned above. It is certainly very rich in endemic plant species. Noteworthy is, that *Ocotea bullata* (Burch.) Baill. was heavily harvested in many South African forests and hence, belongs to those forest trees that have been locally brought to the brink of extinction.

Ecology: *A. flavicolor* is only known from Impetyeni Forest. Like all mistbelt forests, Impetyeni is a species-rich Afrotemperate forest type, containing an important share of subtropical floral elements. Preliminarily, *A. flavicolor* is classified as a montane and forest species that is linked to Afrotemperate forests.

Distribution: *A. flavicolor* is known from the type locality from where only one male specimen exists, collected almost 90 years ago, and hence, it is treated herein as a "rare" species. It is classified as endemic to Afrotemperate forests of the *"Maputaland-Pondoland Region"*. Within this region, *A. flavicolor* most probably does not occur outside of the Eastern Cape and KwaZulu-Natal provinces.

***Arbelodes deprinsi* spec. nov.**

Plate 1, figure 5; figures 5 a, b

Material examined: holotype male, S.A., KwaZulu-Natal, Dragon Peaks Mountain Resort (= Dragon Peaks Park), 09.-12.November.1993, Mey & Ebert leg., ex ZMHB, genitalia slide number 31/122009 I. Lehmann (deposited in the ZMHB).

Etymology: The species is named in honour of Willy De Prins (Leefdaal, Belgium) for his valuable comments on my last publication and for his help in bringing me together with other Lepidopterists working on the Afrotropical Region via the Societas Europaea Lepidopterologica (SEL) of which he is the Membership Secretary and editor of the newsletter. He is a fellow of the Royal Entomological Society (London) and is the Secretary of the Flemish Entomological Society. He is a honorary staff member of the University of Amsterdam and curates the Microlepidoptera collection in the Zoological Museum.

Description of the male (holotype)

Forewing length 15.0 mm; antenna-wing ratio 0.53:1.

Head: small, rough-scaled, pale olive-grey, mixed with long hairs of sepia, deep olive-grey around eyes as well as base of antennae, eyes hair brown and wood brown at centre; a pair of small pits on lower part of frontoclypeus is absent, a pair of medium-sized, oval shaped pits occurs behind the labial palpi; antennae bipectinate, densely scaled on shaft and with scattered scales on the dorsal side of branches, scales pale olive-grey, branches of antennae eight times width of shaft, narrow, covered with hairs in pairs projecting inwards, tip of branch acuminate, bent towards tip of antenna, distance between branches 2.5 times width of branch; labial palpi as long as diameter of eye and covered with pale olive-grey scales, mixed with hairs of sepia. **Thorax**: patagia and tegulae with pure white scales, mixed with long hairs of ivory yellow which are sepia towards tip, a small crest of tilleul-buff scales on metathorax. **Abdomen**: largely olive-buff. **Legs**: femora and tibiae densely covered with scales of cream-buff and mixed with hairs of pale olive-grey, tarsi glossy with scales of cream-buff; two pairs of tibial spurs present on hindlegs, upper pair longer, narrow, 1.2 mm long, inner spur shorter, the lower pair 1.1 mm long, overlapping the first tarsal joint, both pairs glossy, densely covered with cream-buff scales. **Forewing**: upperside deep olive-buff; large patches of pale olive-grey along the termen, in between and edged towards base of wing with large olive-brown patches, some of rectangular shape; an oblique row of white rounded spots from near apex, extending on the veins R_3, R_4, R_5, M_1 to base of M_2; two pure white spots below lower median, edged olive-brown; three white spots below CuA_2, edged olive-brown; cilia long, 1.1 mm long, upper half alternating white and ecru-olive, base ecru-olive. Underside rough-scaled towards base, mixed with hairs, buffy-olive. **Venation**: cell slightly less than half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated from lower angle; M_1 from upper angle; areole elongated; R_5+R_4+R_3 on a long stalk from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell rudimentary, a strong fold extending from upper half of

cell to near the centre of M_2. **Hindwing**: upperside glossy, deep olive-buff. Cilia 1.1 mm long, ecru-olive. Underside like in forewing; frenulum absent. **Venation**: cell less than half length of the wing; 3A and 1A+2A present, CuP absent; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to $Sc+R_1$, the latter crosses the base of the upper median of the cell at almost half of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus long, rounded at tip; tegumen and vinculum fused, forming a firm ring which is very broad on its entire length; valvae broad at base, two lobes present, upper lobe relatively broad and bent towards uncus, rounded at tip which is covered with setae; lower lobe very broad with a deep emargination that forms almost a third small lobe, *ca.* one-third the length of upper lobe, a few short setae present; sacculus narrow; uncus very broad, bifid, tips acuminate, short setae present, a few short setae below the base on each side; juxta broad with a deep emargination, almost C-shaped. Aedeagus simple, tube-like, very long, as long as width of upper lobe and vinculum, rounded basally, rounded and broader distally; vesica without cornuti.

Diagnosis: *A. deprinsi* spec. nov. is related to *A. albitorquata* (Hampson, 1910). Both species occur sympatric in the Dragon Peaks Park. The male genitalia have several characters in common: the presence of a saccus with a rounded tip (the saccus is longer in *A. deprinsi* spec. nov.); a tegumen and vinculum which form a firm ring that is very broad on its entire length; the valvae have two lobes, the upper lobe is relatively broad and bent towards uncus, it has a rounded tip (the tip has much more setae in *A. albitorquata* covering the entire length of the ventral side of the upper lobe); the lower lobe is broad with a deep emargination that forms almost a third small lobe (thorn-like in *A. albitorquata* with more setae); the uncus is very broad and bifid, tips acuminate in both species; the long and simple, tube-like aedeagus is similar in shape and length. A remarkable common feature is the thorn-like structure near the end of the saccus (viewed laterally) which is more developed in *A. deprinsi* spec. nov. The antenna-wing ratio of both species is very similar (0.53:1 and 0.52:1, respectively), but the branches of the antennae are longer in *A. deprinsi* spec. nov. (eight times width of shaft) if compared to *A. albitorquata* (five times width of shaft).

Habitat: Dragon Peaks Mountain Resort (altitude 1255-1300 m) is located in the KwaZulu-Natal Province, central Drakensberg, *ca.* 28 km southwest from Winterton (altitude 966 m; *ca.* 840 mm average annual rainfall). It belongs to the *"Afromontane archipelago-like regional centre of endemism" sensu* White (1983). The property of the resort is *ca.* 410 ha in size and borders the uKlahlamba Drakensberg Park to the west. To the east, it is close to the *"Maputaland-Pondoland Region"* as defined by Van Wyk & Smith (2001). Much of the property includes *"Drakensberg Foothill Moist Grassland" sensu* Mucina *et al.* (2006) with small trees of ,*e.g., Protea roupelliae* Meisn. This grassland type occurs in mountainous areas, incised by river gorges of drier vegetation types and by forest. The forests, which belong to the *"Northern Afrotemperate Forest" sensu* Mucina & Geldenhuys (2006), are of interest here, since *A. deprinsi* spec. nov. is most probably closely linked to them. On the property of the Dragon Peaks Mountain Resort occur two old forests of this type on south-eastern slopes, and a third one on a southern slope. Several smaller forests, some of them might be still primary, occur as well, but include patches that have been badly damaged by alien invasive tree species (*e.g.,* five *Eucalyptus* spp.) and/or other alien invasive plants (e.g., *Solanum mauritianum* Scop.) in the last decades. Dominant species in the old forests include *Podocarpus latifolius* (Thunb.) R. Br., *P. henkelii* Stapf (which is typical for the *"Southern Mistbelt Forest"*, but it marginally occurs also in the *"Northern Afrotemperate Forest"*), *Podocarpus falcatus* (Thunb.) R.Br., *Celtis africana* Burm. f., *Olinia* spec. (? *O. emarginata* Burtt Davy), *Rhamnus prinoides* LHr. and *Greyia sutherlandii* Hook. & Harv. Other common trees include *Halleria lucida* L., as well as smaller trees as *Buddleja salviifolia* (L.) Lam., shrubs as *Leucosidea sericea* Eckl. & Zeyh. and *Rhus dentata* Thunb. Of interest is, that some trees of *Podocarpus falcatus* (Thunb.) R.Br. are very old (between 300-600 years) which indicates ancient forest sites in this area (P. du Preez, pers. comm.).

Ecology: *A. deprinsi* spec. nov. is known only from the forest-grassland mosaic of the Dragon Peaks Mountain Resort. It will be classified as a montane and forest species, which is linked to the *"Northern Afrotemperate Forest"*. This is an impoverished forest type in regard to its floristic composition, usually found as small patches at high altitudes (1300-1900 m). This group of forests is a high altitude analogue to high-latitude Afrotemperate forests of the southern and western Cape (Mucina & Geldenhuys, 2006). The generally patchy dispersal of forests (and possibly of *A. deprinsi* spec. nov.) over the large Drakensberg area is indicative of their relictual character. Hence, in areas were forests are absent today, *A. deprinsi*

spec. nov. might also occur as a relict in clumps of small trees and/or low shrubs, surrounded by various grassland types, to which it became adapted.

Distribution: *A. deprinsi* spec. nov. is known only from the type locality, where its population is certainly small due to a large population of *ca.* 5000 bats at the Drakensberg Boys Choir School (P. du Preez, pers. comm.), *ca.* 1 km from Dragon Peaks Mountain Resort. *A. deprinsi* spec. nov. is classified as an endemic to the Great Escarpment-Drakensberg.

Arbelodes albitorquata (Hampson, 1910), **comb. nov.**

Plate 2, figures 6, 7; figures 6 a, b; 7 a, b

Original combination: *Metarbela albitorquata* Hampson, 1910

Synonyms: none.

Holotype: male, S.A., Transvaal, Pretoria, no date, H.F. Wilson leg., deposited in BMNH (B.M. 1905-317).

Material examined: female, S.A., Mpumalanga Province, Kastrol Nek, January.1922, A. Roberts & G. van Dam leg., ex TMSA, genitalia slide number 10/042010 I. Lehmann (deposited in TMSA); female, S.A., Eastern Cape, Graaff-Reinet District, Farm Onbedacht, 1605 m, 27.December.2002, D. Kroon leg., ex his private coll., deposited in TMSA, genitalia slide number 20/022010 I.Lehmann; male, S.A., Gauteng Province, Suikerbosrand Nature Reserve, 09.-10.November.1980, Dr D. Kroon leg., ex BMNH, B.M. 1981-363, genitalia slide number 01/072007 I. Lehmann (deposited in BMNH, genitalia slide number BMNH COSS 394); male, S.A., KwaZulu-Natal, Balgowan, 01.December.1950, K.M. Pennington leg., ex NMK, genitalia slide number 27/072007 I. Lehmann (deposited in NMK); male, S.A., KwaZulu-Natal, Dragon Peaks Mountain Resort (= Dragon Peaks Park), 09.-12.November.1993, Mey & Ebert leg., ex ZMHB, genitalia slide number 07/022010 I. Lehmann (deposited in the ZMHB); male, S.A., KwaZulu-Natal, Coleford Nature Reserve, 1750-1900 m, 24.-29.November.1999, de Freina leg., ex MWM, genitalia slide number 31/032010 I. Lehmann (deposited in MWM); male, S.A., Eastern Cape, Amathole Mountains, Dohne Peak, 1407 m, "mountainous grassland", 23.November.2000, Krüger & Dombrowsky leg., ex TMSA, genitalia slide number 08/022010 I. Lehmann (deposited in TMSA).

Description of the male (ex Dragon Peaks Mountain Resort, Drakensberg)

Forewing length 12.5 mm; antenna-wing ratio 0.52:1.

Head: rough-scaled, Isabella colour mixed with pure white hairs around eyes as well as base of antennae, eyes wood brown; a pair of small pits on lower part of frontoclypeus is absent, but a pair of small pits occurs behind the upper part of the labial palpi; antennae bipectinate, densely scaled on shaft and dorsal side of branches with Isabella colour mixed with white, branches of antennae five times width of shaft, narrow, covered with hairs in pairs projecting inwards, tip of branch acuminate with one or two thorn-like scales, branches slightly S-shaped, do not touch each other, bent towards tip of antenna, distance between branches 1.5 times width of branch; labial palpi thick, shorter than diameter of eye and covered with scales of ivory yellow as well as Isabella colour. **Thorax**: patagia with hairs of pure white mixed with Isabella colour; a collar ring with pure white hairs, edged towards abdomen with deep olive-buff; tegulae mixed with white and Isabella colour; a small crest of Isabella colour on metathorax. **Abdomen**: largely ivory yellow mixed with Isabella colour. **Legs**: femora and tibiae densely covered with hairs of ivory yellow and Isabella colour; tarsi with scales of ivory yellow; two pairs of tibial spurs present on hindlegs, narrow, upper pair 1.0 mm long, inner spur longer, the lower pair 1.2 mm long, overlapping the first tarsal joint, both pairs glossy, densely covered with ivory yellow scales. **Forewing**: upperside with Isabella colour and a broad white postmedial as well as terminal band; costa mainly white with patches of Isabella colour; small spots of Isabella colour in between the veins from near apex to CuA_1; small, lunulate patches of the same colour along the termen; CuA_2 mainly white, two large, pure white and elongated patches from CuA_2 to the dorsum, in between large patches of Isabella colour; an elongated patch of the same colour in the cell, edged white towards termen; cilia long, 1.1 mm long, alternating deep olive-buff and pure white. Underside rough-scaled, deep olive-buff. **Venation**: cell slightly longer than half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated from lower angle; M_1 from upper angle; areole small; R_5+R_4+R_3 on a stalk from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open

towards termen; lower angle slightly shorter than upper one, veinlet in cell present. **Hindwing**: upperside deep olive-buff; cilia and underside as in forewing; frenulum absent. **Venation**: cell slightly less than half length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs on a stalk and emerging from upper angle; no bar to $Sc+R_1$, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus small, rounded at tip, a thorn-like structure near the end of its base (viewed laterally); tegumen and vinculum fused, forming a firm ring which is very broad on its entire length, vinculum with two tiny thorns; valvae broad at base, two lobes present, upper lobe relatively broad and bent towards uncus, rounded at tip, ventrally with setae on the entire length; lower lobe thorn-like, *ca.* half of the length of upper lobe, very broad at base with a deep emargination that forms almost a third small lobe; a few long setae in between both lobes, and along the S-shaped edge below the base of the lower lobe; an almost rectangular plate behind a small valval apodeme (viewed ventrally); sacculus narrow; uncus very broad, short, bifid, tips acuminate, covered with setae ventrally, a few setae below its base on each side; juxta broad, slightly emarginated with rounded tips. Aedeagus simple, tube-like, very long, almost as long as width of valva and vinculum, rounded basally (slightly elongated with a small acuminate tip when viewed ventrally), rounded and broader distally; vesica without cornuti.

Description of the female (ex Farm Onbedacht)

Forewing length 12.5 mm; antenna-wing ratio 0.44:1.

Head: rough-scaled, hairs cartridge buff with black tips mixed with hairs of pure white around eyes as well as base of antennae, eyes wood brown with small black spots; a pair of small pits on lower part of frontoclypeus is absent, but a pair of small pits occurs behind the upper part of the labial palpi; antennae filiform, densely scaled on shaft with cartridge buff and on the dorsal side of branches with pure white, "branches" of antennae minute, 0.5 times width of shaft, hairs not seen, tip of "branch" acuminate with one or two thorn-like scales, distance between branches 0.5 times width of branch; labial palpi thick, shorter than diameter of eye, covered with scales of colonial buff. **Thorax**: patagia and tegulae with hairs of pure white; a small crest of white hairs with tips of buffy brown on metathorax. **Abdomen**: largely ivory yellow mixed with pure white. **Legs**: femora and tibiae densely covered with hairs of ivory yellow; tarsi with scales of colonial buff; two pairs of tibial spurs present on hindlegs, narrow, upper pair 1.1 mm long, outer spur longer, the lower pair 1.0 mm long, overlapping the first tarsal joint, both pairs glossy, densely covered with ivory yellow scales. **Forewing**: upperside buffy olive, glossy, a broad white postmedial as well as terminal band; costa mainly white with patches of buffy olive; small spots of buffy olive at the end of veins from near apex to CuA_1 along the termen; CuA_2 mainly white with two large, pure white, elongated patches to inner margin, in between large patches of buffy olive; an elongated patch of the same colour in the cell, edged white towards termen; cilia long, 1.2 mm long, alternating buffy olive and pure white. Underside rough-scaled, glossy, buffy olive. **Venation**: cell slightly longer than half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated from lower angle; M_1 from upper angle; areole small; $R_5+R_4+R_3$ on a stalk from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell present and slightly bent. **Hindwing**: upperside buffy olive, pure white towards base of wing; cilia and underside as in forewing; frenulum absent. **Venation**: cell slightly less than half length of the wing; 3A present, 1A+2A rudimentary, CuP present; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to $Sc+R_1$, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle of same length as upper angle, veinlet in cell obsolete. **Genitalia**: abdominal segment 9 broad with a short and narrow gap on the ventral side, the length of this gap is about one-fourth of the length of the whole segment; along the posterior edge of segment 9 are long setae from top to the ventral part where the setae become not denser (note: a few setae extend from the ventral part towards the gap in the female ex Kastrol Nek); posterior apophyses very broad and of almost the same length as anterior apophyses; anterior apophyses not S-shaped, tip rounded; papillae anales broad, elliptic, obliquely 8-shaped, covered with long and short setae, some parts without setae.

Diagnosis: *A. albitorquata* is closely related to *A. deprinsi* spec. nov. Both species occur sympatrically, *e.g.,* in the area of the Dragon Peaks Mountain Resort (*cf.* habitat description above). A minor difference is, that the latter species has not the two tiny thorns on the vinculum which were found in *A. albitorquata*. Only *A. iridescens* (Janse) has four (instead of two) similar thorns on the tegumen, but not on the vinculum. Since major differences exist to the latter species, for example, a hole on the dorsal surface of the uncus, a large valval apodeme and an aedeagus which is very narrow in its central part, *A. iridescens* is not closely related to *A. albitorquata* and *A. deprinsi* spec. nov. The female postabdominal structure of *A. albitorquata* has great differences to the other known females of *A. meridialis*, *A. sebelensis* spec. nov. and *A. claudiae* spec. nov. Remarkable differences of *A. albitorquata* comprise the short and narrow gap on the ventral side of segment 9 (in the other three species this gap is much larger) and the almost same length of the anterior and posterior apophyses (the latter are much longer than the anterior apophyses in the other three species). Nevertheless, the posterior apophyses are large and broad and the anterior apophyses are short, if compared to other genera of the Metarbelidae.

Habitat (examples): Firstly, Kastrol Nek (Mpumalanga Province) is located *ca.* 15 km northeast of Wakkerstroom (altitude 1729-1760 m, average annual rainfall 814 mm) and 3 km northwest of the Farm Tafelkop, where the road crosses over the mountain from higher ground to the lower lying region beyond on the road to Piet Retief. The area belongs to the *"Kalahari-Highveld regional transition zone" sensu* White (1983). Kastrol Nek is *ca.* 14 km away from the *"Maputaland-Pondoland Region"* as defined by Van Wyk & Smith (2001). The area at an altitude of 1440-2200 m is largely characterized by *"Wakkerstroom Montane Grassland" sensu* Mucina *et al.* (2006). This grassland type is a less obvious continuation of the escarpment that links the southern and northern Drakensberg escarpments. It is predominantly short montane grassland, with short forest and woody thickets occurring along steep, mainly east-facing slopes and drainage lines. Small trees as *Canthium ciliatum* (Klotzsch) Kuntze and *Protea subvestita* N.E. Br. occur; important woody shrubs include, *e.g., Leucosidea sericea* Eckl. & Zeyh. (invades grassland due to grazing mismanagement), *Buddleja salviifolia* (L.) Lam., *B. auriculata* Benth., *Diospyros lycioides* Desf. ssp. *guerkei* (Kuntze) De Winter and *Rhus montana* Diels. Although several endemic species of the southern escarpment as well as northern escarpment occur, the area contains many own endemics and hence, it is under investigation as a possible centre of endemism (Mucina *et al.*, 2006). Towards Piet Retief, which is located northeastern of Kastrol Nek, this grassland type borders *"Paulpietersburg Moist Grassland" sensu* Mucina *et al.* (2006) at an altitude of 920-1500 m. Woody vegetation is characteristic on rocky outcrops. Small trees include, in addition to the ones mentioned above, *Dombeya rotundifolia* (Hochst.) Planch. and *Vangueria infausta* Burch. Both grassland types contain a number of alien species as *Acacia mearnsii* (Vahl) Benth., various *Eucalyptus* and *Pinus* species. Noteworthy is the occurrence of several smaller patches of *"Northern Afrotemperate Forest" sensu* Mucina & Geldenhuys (2006) between 5–15 km northeast and east of Wakkerstroom. Hence, the habitat of *A. albitorquata* around Kastrol Nek represents a mosaic of forests and thickets which are embedded in two natural grassland types.

Secondly, the Farm Onbedacht (altitude up to 1800 m) is located in the Eastern Cape Province, *ca.* 80 km west (by road) of the town Graaff-Reinet, and north of the small town Aberdeen, in the southwestern part of the Koudeveldberge. The Farm Toorberg (average altitude 1300 m; average annual rainfall 500 mm) is *ca.* 5 km northeast from Farm Onbedacht. The area belongs to the less-elevated parts of the *"Afromontane archipelago-like regional centre of endemism" sensu* White (1983) and borders White's *"Karoo-Namib regional centre of endemism"* and *"Kalahari-Highveld regional transition zone"*. Van Wyk & Smith (2001) included the Sneeuberg mountain complex into the *"Albany Centre"* which comprises various of White's phytochoria. The thickets are the single most conspicuous component of the vegetation of the Albany Centre. Since Farm Onbedacht is located in the Koudeveldberge (1900 m), which belong to the Sneeuberg mountain complex, it is part of the Afromontane belt of southern Africa. Clark *et al.* (2009) treated the Sneeuberg mountain complex as an own centre of floristic endemism, including 1195 species of which 2,8 % are endemic. It is noteworthy, that it contains the highest peaks (2278-2504 m) in the Great Escarpment west of the Eastern Cape Drakensberg, among which the Compassberg (2504 m) is one of the highest free-standing southern African peaks outside of the Drakensberg and the Lesotho Highlands. The climate is, as the vegetation, transitional between the arid west and moist east. Severe droughts, high rainfall, frost as well as deep snowfalls occur. On Farm Onbedacht, the vegetation is a mosaic that changes within a short distance. The vegetation types include *"Karoo Escarpment Grassland"* (1100-1800 m) *sensu* Mucina *et al.* (2006), *"Upper Karoo Hardeveld"* (1000-1500

m) *sensu* Mucina *et al.* (2006), *"Eastern Lower Karoo"* (500-1100 m) *sensu* Mucina *et al.* (2006), *"Camdebo Escarpment Thicket"* (570-1600 m) *sensu* Hoare *et al.* (2006) and at the middle reaches (1200-1600 m) in deeper valleys a kind of temperate thicket (Cowling *at al.*, 2005) characterized by, *e.g., Olea europaea* L. ssp. *africana* (Mill.) P.S. Green. The latter type of a temperate thicket occurs a few hundred meters away and below from the collecting site which was at 1605 m. The collecting site was located among a dense, tangled thicket with many climbers and restricted grass cover near a small mountain stream and can be characterized as *"Camdebo Escarpment Thicket" sensu* Hoare *et al.* (2006) that is largely subtropical, but includes also temperate thicket elements. Important plant species of the *"Camdebo Escarpment Thicket"* comprise climbers of *Asparagus, e.g., A. asparagoides* (L.) Druce, small trees of *Cussonia paniculata* Eckl. & Zeyh. and *Olea europaea* L. ssp. *africana* (Mill.) P.S. Green. Grass cover is largely absent. It is noteworthy, that a typical succulent, namely *Portulacaria afra* (L.) Jacq., a species with a main link to the thickets of the Albany Centre, is naturally (?) absent on Farm Onbedacht, but will be planted in the future (D. Kroon, pers. comm.).

Thirdly, the Amathole or Amatole Mountains (Eastern Cape Province) form a part of the Great Winterberg Range (2360 m) and are located *ca.* 90 km northeast of Grahamstown. The Winterberg – Amatole Mountains belong to the eastern Great Escarpment and hence, to the *"Afromontane archipelago-like regional centre of endemism"sensu* White (1983). It is noteworthy, that the highest peaks of the Amatole Mountains represent remnants of the Gondwanan surface (Agnew, 1958). Van Wyk & Smith (2001) included these mountains in the *"Albany Centre"*. Large areas of the Amatole Mountains are still covered with species-rich, tall (15-20 m)*"Southern Mistbelt Forest"* (850-1600 m) *sensu* Mucina & Geldenhuys (2006), especially on the south- and southeast-facing slopes, dominanted by *Podocarpus falcatus* (Thunb.) R.Br., *Celtis africana* Burm. f., *Calodendrum capense* (L.f.) Thunb., *Vepris lanceolata* (Lam.) G. Don and *Zanthoxylum davyi* (I. Verd.) P.G. Waterman. Another main vegetation type is *"Amathole Mountain Grassland"* (650-1500 m; average annual rainfall 670 mm) *sensu* Mucina *et al.* (2006), with short grasses and a high diversity of forbs, especially of Asteraceae. Low shrubs include, *e.g., Anthospermum rigidum* Eckl. & Zeyh., *Chrysocoma ciliata* L., and *Erica amatolensis* E.G.H. Oliv. The collecting site falls most probably into this vegetation type. Imbedded in this grassland, especially close to the summits as well as in incised valleys, are hundreds of patches of *"Drakensberg-Amathole Afromontane Fynbos"* (altitude ranges 1520-1660 m and 1900-2060 m) *sensu* Mucina *et al.* (2006), with tall shrubs *e.g., Melianthus villosus* Bolus and small shrubs *e.g., Erica* ssp. Noteworthy is also *"Amathole Mistbelt Grassland"* (1380-2080 m) *sensu* Mucina *et al.* (2006) on undulating slopes below the peaks with a high diversity of *Helichrysum* ssp.

Fourthly, Suikerbosrand Nature Reserve (11595 ha) is located in the Gauteng Province, *ca.* 35 km south of Johannesburg (1753 m; average annual rainfall 713 mm) and almost borders at the town of Heidelberg in the east. The reserve includes the Suikerbosrand Mountain Range (1545-1917 m) and is part of the *"Kalahari-Highveld regional transition zone"sensu* White (1983). It is mainly comprised of five vegetation types, namely *"Northern Afrotemperate Forest"* (> 1450 m, remnants restricted to mountain kloofs and low ridges) *sensu* Mucina & Geldenhuys (2006), *"Soweto Highveld Grassland"* (1420-1760 m), *"Tsakane Clay Grassland"* (1480-1680 m) *sensu* Mucina *et al.* (2006), *"Gold Reef Mountain Bushveld"* and *"Andesite Mountain Bushveld"* (1350-1800 m) *sensu* Rutherford *et al.* (2006). According to the dominant tree and shrub species at the collecting site (see below), the latter vegetation type is of interest here. *"Andesite Mountain Bushveld"* is characterized by dense, medium to tall thorny bushveld with a well-developed grass layer on hill slopes and some valleys with undulating landscape. The collecting site was in open-kloof bush, as described by Day (1975) for the Suikerbosrand Nature Reserve, with small trees of *Acacia karroo* Hayne, *Celtis africana* Burm. f., *Protea caffra* Meisn. and tall shrubs as *Euclea crispa* (Thunb.) Gürke, *Heteromorpha trifoliata* (H.L. Wendl.) Eckl. & Zeyh., *Rhus pyroides* Burch. var. *pyroides*, *Diospyros lycioides* Desf. ssp. *lycioides* and *Rhamnus prinoides* L'Hér.

Ecology: *A. albitorquata* is classified as a montane species and is associated with ancient Afromontane grassland-forest or grassland-thicket mosaics occurring in some of the highest elevation regions in southern Africa. In these regions, rainfall is high, snow, frost and mists are common and temperatures are usually cool. Hence, *A. albitorquata* is a frost-tolerant species and the long, dense hairs on body and wings as well as its largely white wing colour might support such an adaptation. *A. albitorquata* has a wide ecological tolerance and occurs in Afrotemperate forests (*e.g.,* in the Balgowan complex); in subtropical savannas of the Central Bushveld, with a continuum between shrubs and trees with no distinct layer (*e.g.,* around

Suikerbosrand and Pretoria at 1369 m); in subtropical southern African thickets as well as in temperate thickets (*e.g.*, Farm Onbedacht) and in high-altitude temperate grasslands with small shrubs. Its major link to subtropical and temperate grasslands, thickets and forests of the Great Escarpment-Drakensberg, which represents a relict of the Gondwana continental margin in the form of mountain ranges with scarp slopes, might point towards a very ancient adaptation to a temperate climate.

Distribution: *A. albitorquata* has a narrow range and occurs primarily on the Great Escarpment-Drakensberg, including possibly the Lesotho Highlands. Hence, it is strongly linked and probably endemic to the *"Afromontane archipelago-like regional centre of endemism"* in southern Africa (Lesotho and South Africa in particular). Its occurrence in various types of grassland in the Mesic Highveld Grassland Bioregion (*e.g.*, Suikerbosrand) is not surprising, since this Highveld extends as far as the northern Great Escarpment-Drakensberg (Mucina *et al.*, 2006). *Arbelodes albitorquata* occurs in the northern Drakensberg and is known from Machadodorp (Janse, 1925) that is characterized by *"Lydenburg Montane Grassland" sensu* Mucina *et al.* (2006). It has strong links to the Afromontane flora and to the Zimbabwean Highlands. From here it extends to areas around Kastrol Nek which link the northern and southern Drakensberg. Via the Drakensberg it occurs southwestwards to the Amathole Mountains (eastern Great Escarpment) and further west to the Sneeuberg mountain complex. The latter is currently the southwestern limit of its distribution on the Great Escarpment, but *A. albitorquata* is expected to extend slightly further west to the Nuweveldberge (western Great Escarpment). It's distribution in savannas of the Central Bushveld, *e.g.*, around Pretoria and Suikerbosrand, suggests an extension of its range slightly westwards from the northern Drakensberg. A record from Durban mentioned by Janse (1925) is very interesting, since it shows the occurrence of a montane species at the coastal lowlands, indicating an historic link of a once continuous forest belt from the Drakensberg, *e.g.*, via the Balgowan forest complex, to the subtropical forests along the Indian Ocean coastline in the *"KwaZulu-Natal Coastal Belt" sensu* Mucina *et al.* (2006).

Arbelodes collaris Aurivillius, 1921

Plate 2, figure 8; figures 8 a, b

Original combination: *Arbelodes collaris* Aurivillius, 1921

Synonyms: None

Holotype: S.A., Transvaal, Potgietersrus, deposited in TMSA.

Material examined: Co-Type, male, S.A., Transvaal, Potgietersrus, September.1919, G.M. Melle leg., ex NRM, genitalia slide number 25/102009 I. Lehmann (deposited in NRM).

Description of the male (Co-Type):

Forewing length 12.0 mm; antenna-wing ratio 0.50:1.

Head: rough-scaled, pale smoke grey around eyes as well as base of antennae, eyes wood brown with small black spots; a pair of small pits on lower part of frontoclypeus is absent, but a pair of small pits occurs behind the central part of the labial palpi; antennae bipectinate, densely scaled on shaft and dorsal side of branches with smoke-grey; branches of antennae eight times width of shaft, narrow, covered with hairs in pairs projecting inwards, tip of branch acuminate with one or two thorn-like scales, branches strongly bent towards tip of antenna, S-shaped, do not touch each other, the distance between the branches is the same like the width of branch; labial palpi narrow, as long as diameter of eye and covered with pale smoke grey scales. **Thorax**: patagia pale smoke grey and with a collar ring of sepia; tegulae pale smoke grey, some scales with sepia at centre; a small crest of sepia on metathorax. **Abdomen**: largely ivory yellow mixed with pale smoke grey. **Legs**: femora and tibiae densely covered with pale smoke grey hairs, sepia at centre; tarsi with scales of pale smoke grey; hindlegs missing. **Forewing**: upperside deep olive-buff, glossy; a broad, almost triangular band of pale olive-buff from costa to the dorsum, edged sepia, in the upper half with a small triangular patch of sepia; costa pale smoke grey with patches of sepia; a small pure white spot below CuA_2; a large sepia coloured patch, edged white towards termen, near base of wing and in between lower median and vein 1A+2A; cilia long, 1.0 mm long, at base pale smoke grey, sepia towards tip. Underside rough-scaled towards base of wing, deep olive-buff, glossy. **Venation**: cell slightly longer than half length of the wing; 1A+2A forked at

base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 from the same point and from lower angle; M_1 from upper angle; areole protruding upper angle; R_5+R_4+R_3 on a stalk from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell obsolete. **Hindwing**: upperside deep olive-buff; cilia deep olive-buff, 1.0 mm long, underside deep olive-buff; frenulum absent. **Venation**: cell shorter than half length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 from the same point; M_1 and Rs on a long stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-fourth of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus small, rounded at tip; tegumen and vinculum fused, forming a firm ring which is broad on its entire length; valvae broad at base, two lobes present, upper lobe rather narrow and bent towards uncus, rounded at tip with a few setae; lower lobe broad at base, thorn-like, half the length of upper lobe, basal end of the lower lobe elongated ventrally and acuminate; a few setae in between both lobes; sacculus narrow; uncus very short, resembling the ears of a cat's head when viewed laterally, bifid, tips acuminate, few setae near the tips; a protruding and rounded structure (the cat's face) below the uncus and covered with long setae; juxta broad, emarginated with acuminate, horn-like tips. Aedeagus simple, tube-like, short, almost as long as length of lower lobe, rounded basally, rounded and much broader distally; vesica without cornuti.

Diagnosis: *A. collaris* has several unique characters which do not exist in other *Arbelodes*: Firstly, M_3 and M_2 emerge from the same point of the lower angle in the forewing as well as in the hindwing, but are separated in all other species. Secondly, the uncus is currently the shortest among the *Arbelodes*. A similar, but slightly larger uncus with rather truncate ends (viewed laterally) occurs in *Arbelodes prochesi* spec. nov. (see below). Due to this outstanding similarity of a short uncus, *A. prochesi* spec. nov. is currently closest related to *A. collaris*. However, the uncus of the latter species with its cat-like head below (viewed laterally) is peculiar. Thirdly, both lobes have only a few setae and the lower lobe is almost entirely without setae. Longer setae occur in *A. prochesi* spec. nov. and are scattered on the entire length of the upper lobe, becoming denser near the rounded tip and along the upper half of the lower lobe. The lower lobe is longer in *A. prochesi* spec. nov. (two-thirds the length of the upper lobe), but only half the length of the upper lobe in *A. collaris*. The basal end of the lower lobe has an appendage ventrally which is square-shaped and has an truncate end in *A. prochesi* spec. nov. This structure is entirely absent in *A. collaris* where the ventral side of the base of the lower lobe forms an acuminate thorn. Another difference is the shape of the juxta. It is broad with horn-like tips in *A. collaris*, but narrow with a stick-like structure at centre in *A. prochesi* spec. nov.

Habitat: Mokopane (formerly Potgietersrus; altitude 1100 m; average annual rainfall 595 mm) is located in the Limpopo Province *ca.* 55 km southwest of Polokwane. The area belongs to the *"Zambezian regional centre of endemism" sensu* White (1983). The vegetation around Mokopane is largely characterized by *"Makhado Sweet Bushveld"*(altitude range 850-1200 m) *sensu* Rutherford *et al.* (2006). This is a short and shrubby bushveld with a poorly developed grass layer. It is transitional between the higher-lying Polokwane Plateau and the lower-lying vegetation types of the Limpopo River Valley. Important small tree species include, *e.g., Acacia erubescens* Welw., *A. gerrardii* Benth., *A. mellifera* (Vahl) Benth., *A. rehmanniana* Schinz as well as tall shrubs of *Commiphora pyracanthoides* Engl., *Grewia flava* DC. and *Lycium shawii* Roem. & Schult. A few kilometers northeast and east of Mokopane occurs *"Polokwane Plateau Bushveld" sensu* Rutherford *et al.* (2006) at an altitude of 1100-1500 m. The tree layer is more open, and hence, the grass layer is well-developed. Important tree species are, *e.g., Acacia caffra* (Thunb.) Willd., *A. permixta* Burtt Davy, *A. karroo* Hayne, *A. tortilis* (Forssk.) Hayne, *Aloe marlothii* A. Berger and *Ormocarpum kirkii* S. Moore. Tall shrubs of *Diospyros lycioides* Desf. ssp. *sericea* (Bernh.) De Winter and *Combretum hereroense* Schinz occur. The dominant tree species around Mokopane are not typically for miombo woodlands, where the related species of *A. collaris*, namely *A. prochesi* spec. nov., occurs.

Ecology: *A. collaris* is classified as a montane species. It is associated with legume-dominated woodland. Although it has been found in vegetation comprising typical savanna components of the genera *Acacia*, *Combretum* and *Commiphora* in an area where frost is fairly infrequent (in contrast to several other *Arbelodes* habitats), *A. collaris* is not classified as a savanna species here, but as a relict of woodlands.

Distribution: *A. collaris* is only known from the type locality. It is not linked to the large distribution of savanna vegetation in Africa. Hence, the pattern of *A. collaris* is different and represents a relict distribution that is expected to extend slightly east (*e.g.,* to the Waterberg) and north (*e.g.,* to the Soutpansberg). Further records from the literature or from museum material are not available. The following two aspects are noteworthy: Firstly, Janse (1925) did not mention *A. collaris* and perhaps, has overlooked this species. This is interesting, since he was one of the leading authorities on South African moths until he died in 1970. That he did not find it in the field during his extensive studies in South Africa might suggest, that *A. collaris* is rare. Secondly, a female in the BMNH determined as *A. collaris* by Gaede (label: no date, „Grahamstown", no collector) does belong to another, probably undescribed, *Arbelodes* species.

***Arbelodes prochesi* spec. nov.**

Plate 2, figures 9 a, b; figures 9 a, b

Material examined: holotype male, North Rhodesia, Kalomo, no date, C.W. Brames Hall leg., ex BMNH, B.M. 1928-548; genitalia slide number 20/072007 I. Lehmann (deposited in BMNH, genitalia slide number BMNH COSS 395).

Paratype male, Vumba Mt., Umtali, South Rhodesia, October.1953, E. Pinhey leg., ex NMK, genitalia slide number 01/082007 I. Lehmann (deposited in NMK).

Etymology: the species is named in honour of Dr Şerban Procheş (University of KwaZulu-Natal, Durban) for his valuable comments on the botanical issues presented in this paper.

Description of the male (holotype)

Forewing length 12.0 mm; antenna-wing ratio 0.58:1.

Head: rough-scaled, pale olive-buff around eyes as well as base of antennae, eyes wood brown; a pair of small pits on lower part of frontoclypeus is absent, but a pair of small pits occurs behind the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches with pale olive-buff; branches of antennae seven times width of shaft, narrow, covered with single hairs as well as hairs in pairs projecting inwards, tip of branch acuminate with one or two thorn-like scales, branches slightly bent towards tip of antenna, do not touch each other, distance between branches almost as width of the branch; labial palpi narrow, as long as diameter of eye and covered with pale olive-buff scales. **Thorax**: patagia pale olive-buff with a collar ring of citrine drab; tegulae pale olive-buff; a small crest of sepia on metathorax. **Abdomen**: largely pale olive-buff. **Legs**: femora, tibiae and tarsi covered with hairs alternating white and citrine drab; hindlegs with two pairs of spurs, rather short, 0.7 mm, overlapping first tarsal joint. **Forewing**: costa not straight, but slightly oblique; upperside pale olive-buff; apex and costal margin pallid brownish drab with several streaks of olive-brown; a pure white patch in the cell, edged olive-brown towards the dorsum; a white subterminal line edged olive-brown towards the termen; below CuA_2 a large patch of olive-brown, resembling a horseshoe, edged white, extending to the dorsum; below lower median and near base of wing a large pure white patch with two olive-brown spots, the smaller one is triangular; cilia long, 1.0 mm, pale olive-buff, some with pure white tips. Underside rough-scaled towards base of wing, deep olive-buff, glossy; costal margin pallid brownish drab with several streaks of olive-brown. **Venation**: cell slightly longer than half length of the wing; 1A+2A only weakly forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole protruding upper angle; R_5+R_4+R_3 from top of areole, but not stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell present. **Hindwing**: upperside pale olive-buff; cilia like in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus small, truncate at tip; tegumen and vinculum fused, forming a firm ring which is broad on its entire length; valvae broad at base, two lobes present, upper lobe narrow and bent towards uncus, rounded at tip with many short setae, scattered longer setae along the entire length on the ventral side; lower lobe broad, broader at base, thorn-like, two-thirds the length of upper

lobe, a few setae on the ventral side; basal end of the lower lobe with an appendage that is square-shaped and has an truncate end; sacculus narrow; uncus very short, bifid with a rounded emargination, a truncate appearance when viewed laterally, few setae below the tips; juxta wide and narrow, not horn-like, a stick-like structure at centre. Aedeagus simple, tube-like, long, slightly longer than length of lower lobe, rounded basally, rounded and much broader distally; vesica without cornuti.

Diagnosis: *A. prochesi* spec. nov. is related to *A. collaris* (*cf.* diagnosis above).

Noteworthy are three differences between the holotype (ex Kalomo) and the paratype (ex Vumba Highlands): Firstly, the antenna-wing ratio in the paratype is 0.52:1, but in the holotype 0.58:1. Secondly, a pure white and V-shaped patch below the lower median and near the base of the forewing in the paratype is absent in the holotype. Thirdly, a veinlet is emerging from below the stalk of M_1 and Rs in the paratype. However, the wing pattern, venation and genitalia are very similar. Hence, it is currently not justified to describe the paratype as a different and new species. This might change when more specimens from both localities are available in the future.

Habitat: Firstly, Kalomo (altitude 1219 m; average annual rainfall 584 mm) is located on the southern plateau region of Choma-Kalomo in the south-central part of the Southern Province of Zambia, *ca.* 110 km northeast of Livingstone. The area belongs to the *"Zambezian regional centre of endemism" sensu* White (1983). Around Kalomo, the vegetation changed in the last 55 years and much of the area has been cultivated for tobacco or other annual crops. The natural vegetation is miombo woodland, interspersed with dambo grassland. The miombo surrounding Kalomo is dominated by *Brachystegia longifolia* Benth. (dominant species), *B. spiciformis* Benth., *B. boehmii* Taub., *Julbernardia globiflora* (Benth.) Troupin, *Albizia antunesiana* Harms, *Erythrophleum africanum* (Welw.) Harms, including small trees of, *e.g., Bauhinia petersiana* Bolle, *Diospyros lycioides* Desf., *D. mespiliformis* A.DC., *Lannea discolor* (Sond.) Engl. and *Diplorhynchus condylocarpon* (Muell.Arg.) Pichon. Dambo grasslands include, *e.g.,* dwarf suffrutices, so-called "underground trees", that evolved from various tree species as *Syzygium guineense* (Willd.) DC. ssp. *huillense* (Hiern) F. White (moist dambo type) and *Parinari capensis* Harv. (drier dambo type). Mopane woodland, sometimes dominated exclusively by *Colophospermum mopane* (Benth.) J.Léonard, relicts of *Baikiaea* forests (dominated by *Baikiaea plurijuga* Harms and *Pterocarpus antunesii* (Taub.) Harms) and lines of riverine woodland or thicket, dominated by, *e.g., Syzygium guineense* (Willd.) DC., *S. cordatum* Hochst., *Faidherbia albida* (Delile) A. Chev. and *Albizia harveyi* E. Fourn. occur throughout the miombo of the Kalomo District, but are usually patchy in distribution. Termitaria are widely distributed in miombo, dambo margins and mopane woodland. They are covered by vegetation that has a different species composition comprising, *e.g., Commiphora mollis* (Oliv.) Engl., *Albizia amara* (Roxb.) Boiv., *Lannea discolor* (Sond.) Engl., *Olea europaea* L. ssp. *cuspidata* (G. Don.) Cif. and *Ziziphus mucronata* Willd. (D.B. Fanshawe, 1970, unpublished; J. Timberlake, pers. comm.).

Secondly, the Bvumba (the Shona name for mist) or Vumba Highlands (altitude 1911 m at Castle Beacon; average annual rainfall 1800 mm) form, together with the ranges Chimanimani (2440 m) and Nyanga (2592 m), the Eastern Highlands of Zimbabwe and border on to Mozambique in the east and north. All three ranges are part of the *"Afromontane archipelago-like regional centre of endemism" sensu* White (1983) and represent a resistant remnant of the Gondwanaland erosion surface, whilst the surrounding areas are African erosion surface. The Vumba Highlands (*ca.* 200 km^2 in size) are located southeast of Mutare (formerly Umtali, altitude 1341 m) and are separated to the north by the Manica Gap from the Penhalonga and Stapleford areas and to the south by the Burma Valley from the Tsetsera Range. Southeast of Mutare, a road reaches a *Brachystegia spiciformis* Benth. woodland after *ca.* 700 m with abruptly changes into mist forests. Seven types of forest have been described by Müller (2006), largely based on his fieldwork undertaken in the 1970's. Additionally, various types of woodlands as well as scrub and grasslands were described (*cf.* www.vumba-nature.com). Many of them are small in extant or heavily disturbed today with invasions of *Acacia mearnsii* De Wild. The forests above 1650 m are dominated, for example, by *Syzygium guineense* (Willd.) DC. ssp. *afromontanum* F. White, *Ilex mitis* (L.) Radlk., *Maesa lanceolata* Forssk., *Podocarpus latifolius* (Thunb.) Mirb., *Aphloia theiformis* (Vahl) Benn., *Cassipourea malosana* (Baker) Alston. In their subcanopy occur, *e.g., Tabernaemontana stapfiana* Britten and *Pavetta umtalensis* Bremek. At the same altitude, regenerating montane forest is particularly common on the Vumba Highlands dominated by *Macaranga capensis* (Baill.) Sim, *Aphloia theiformis* (Vahl) Benn. and *Xymalos monospora* (Harv.) Baill. In between 1350 and 1650 m occurs a "mixed submontane forest", also near Mutare. In a mature forest of this type is the highest tree species richness recorded for

Zimbabwe (Müller, 2006) including, *e.g.*, *Syzygium guineense* (Willd.) DC. ssp. *afromontanum* F. White, *Nuxia congesta* Fresen, *Rapanea melanophloeos* (L.) Mez, *Podocarpus latifolius* (Thunb.) Mirb. and *Chrysophyllum gorungosanum* Engl. mixed with legumes as *Craibia brevicaudata* (Vatke) Dunn ssp. *baptistarum* (Buettner) J.B. Gillett. At the same altitude range occur different types of legume-dominated forest patches as almost pure stands of *Craibia brevicaudata* (Vatke) Dunn mixed with *Dracaena steudneri* Engl. Near Mutare, patches dominated by *Albizia gummifera* (J.F. Gmel.) C.A. Sm. or *A. schimperiana* Oliv., *e.g.*, with *Cussonia spicata* Thunb. occur. They change abruptly into *Brachystegia* woodland.

Elliot Pinhey's description of "Vumba Mt., Umtali", might refer to the upland parts, although this is not sure. The Umtali/Vumba area was a favourite collecting site in the 1950's until the 1970's. Elliot Pinhey collected so widely, and with his assistants, would cover as much ground on any trip as possible, that it is likely to have been anywhere around Umtali in the mountains or along streams. However, two facts are of importance in this context: Firstly, on the north and west facing slopes, and towards Mutare (Umtali), a drier type of *Brachystegia* woodland occurs below 1500 m. This woodland type has two dominant tree species that also occur around Kalomo (where the holotype was collected), including *Brachystegia boehmii* Taub. and *Julbernardia globiflora* (Benth.) Troupin. *Brachystegia spiciformis* Benth., another dominant species around Kalomo, occurs also as dominant tree in woodlands around Mutare above 1500 m, in rocky areas near cliffs and on east facing slopes down to 1200 m. Secondly, the majority of *Arbelodes* species occur in southern African Afrotemperate forest or in a mosaic of grassland with patches of Afrotemperate forest and/or subtropical/temperate thicket in mountainous areas. Several of the dominant tree species in these Afrotemperate forests occur in the montane forests of the Vumba Highlands, *e.g.*, *Podocarpus latifolius* (Thunb.) Mirb. It is a palaeoendemic element. Grasslands on the Vumba Highlands are characterized, for example, with isolated woody legumes of *Erythrina lysistemon* Hutch., or typical thicket species like *Cussonia spicata* Thunb. (altitude range 1350-1650 m). Thicket-like vegetation and mixed scrub is represented at altitudes above 1550 m, comprising *Erica hexandra* (S. Moore) E.G.H. Oliv., *Aphloia theiformis* (Vahl) Benn., *Rhus ?chirindensis* Baker f. and *Ochna holstii* Engl. In these thickets occur forest and open woodland species together. An ericoid scrub above 1800 m, occurring around the highest peaks, is dominated by *Protea* spp., *Aloe arborescens* Mill., *Strelitzia caudata* R.A. Dyer (a Cretaceous relict) and *Erica* spp. It is unlikely that these highest areas were meant by Elliot Pinhey since, *e.g.*, Castle Beacon is more than 10 km away from Mutare.

Ecology: *A. prochesi* spec. nov. is classified as a montane species. At present, it is associated with species-rich and legume-dominated woodlands that include tropical elements as well as relicts of *Baikiaea* forests. Associations with uplands on the Vumba Highlands are very likely. Mountainous areas with frost, mist and a mosaic of patches of forest/woodland and/or thicket, embedded in a grassland matrix, are the typical habitat of the genus *Arbelodes*. Of interest is, that *A. prochesi* spec. nov. was not yet recorded from other miombo woodlands, including areas from where long-term Metarbelidae collections exist (*e.g.*, from around Mbala or in northern, central and southern Malawi). Hence, *A. prochesi* spec. nov. is historically not linked to miombo, which is a tropical vegetation type, but most probably to an admixture of forest and woodland with subtropical and/or temperate elements that occurred on the Vumba Highlands and on plateau areas of south-central Zambia possibly before Africa moved northwards 30-25 myr BP.

Distribution: *A. prochesi* spec. nov. has a disjunct distribution, occurring on a plateau area of south-central Zambia and on the Eastern Highlands of Zimbabwe, possibly extending into Mozambique (*e.g.*, Serra Vumba). This disjunction is indicative for a relict distribution. Although Elliot Pinhey collected widely with his assistants in the Vumba Highlands, possibly over many years, only a single specimen is known. This indicates that *A. prochesi* spec. nov. might be „rare". The single record from Kalomo supports the author's opinion.

***Arbelodes sebelensis* spec. nov.**

Plate 2, figure 10; figures 10 a, b

Material examined: holotype female, Botswana, Bakgatla, Sebele, 08.September.1969, R.E. Roome leg., presented by Commonwealth Institute of Entomology, number A 4029, ex BMNH, B.M. 1971-1; genitalia slide number 28/022010 I. Lehmann (deposited in BMNH, genitalia slide number BMNH COSS 417).

Etymology: the species is named from the type locality Sebele (southeast Botswana).

Description of the female (holotype)

Forewing length 11.0 mm; antenna-wing ratio 0.36:1.

Head: rough-scaled, pale olive-buff scales mixed with long sepia coloured hairs around eyes as well as base of antennae, eyes wood brown with small black patches; a pair of small pits on lower part of frontoclypeus is absent, but a pair of small pits occurs behind the upper part of the labial palpi; antennae densely scaled on dorsal side of shaft with ivory yellow mixed with sepia; shaft serrate, branches less than width of shaft, covered with scales of ivory yellow, a few scattered minute hairs ventrally; labial palpi narrow, small, less than half of diameter of eye and covered with colonial buff scales and long hairs of sepia. **Thorax**: patagia and tegulae with long scales, pale olive-buff, tips light brownish olive, mixed with black hairs; a small crest of ivory yellow on metathorax. **Abdomen**: not longer than the hindwings; largely ivory yellow. **Legs**: femora, tibiae and tarsi with scales of colonial buff, femora with scattered black hairs; hindlegs with two pairs of spurs, narrow, short, 0.7 mm long. **Forewing**: upperside pale olive-buff mixed with scales of light brownish-olive; postmedial line light brownish-olive; a small patch of chamois at the end of cell with a triangular patch of sepia towards base of wing; a large patch of sepia below lower median and near base of wing; CuA_2 pure white at base and from below its centre a rectangular patch of sepia to the dorsum; cilia long, 1.1 mm, pale olive-buff with tips of light brownish olive. Underside rough-scaled towards base of wing, ivory yellow mixed with pale olive-buff and light brownish olive, glossy. **Venation**: cell slightly longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 from lower angle, separated; M_1 from upper angle; areole protruding upper angle; R_5+R_4+R_3 from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell present, rather obsolete towards base. **Hindwing**: upperside with a broad band of light brownish olive, towards base white as well as ivory yellow; cilia and underside as in forewing; frenulum absent. **Venation**: cell shorter than half length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-fourth of its length; discocellular angled inwardly, from upper median a rudimentary veinlet into the cell, lower angle slightly shorter than upper angle, veinlet in cell present, obsolete at centre. **Genitalia**: abdominal segment 9 broad with a broad and ovate gap on the ventral side, the length of this gap is about half the length of the segment; posterior edge with scattered long setae from top to the ventral part where the setae become denser; posterior apophyses very broad and of five times the length as anterior apophyses; anterior apophyses extremely short, rather rudimentary, tip rounded; papillae anales very broad and large, elliptic, obliquely 8-shaped, covered with long and short setae, some parts without setae.

Diagnosis: *A. sebelensis* spec. nov. is related to *A. claudiae* spec. nov. and possibly to *A. collaris* Aurivillius. However, in the latter species M_3 and M_2 emerge from the same point of the lower angle in the forewing as well as in the hindwing, but are clearly separated on both wings in *A. sebelensis* spec. nov. Two peculiar characters exist in *A. sebelensis* spec. nov.: Firstly, the anterior apophyses are by far the shortest known among the Metarbelidae and have a rudimentary appearance. Secondly, the posterior apophyses are currently the largest among the *Arbelodes* and one of the largest among the Metarbelidae.

Habitat: Sebele (altitude 994 m; average annual rainfall 500 mm) is located 3 km north of Gaborone (southeast Botswana) and 10-16 km west from the border to South Africa. Of interest is the subtropical climate, the fairly frequent occurrence of frost (similar to other habitats of the genus *Arbelodes*) in the very dry winters as well as the high mean annual potential evaporation for a savanna vegetation type. The area belongs to the *"Kalahari-Highveld regional transition zone" sensu* White (1983). He classified the vegetation around Gaborone as *"Kalahari thornveld and the transition to Zambezian broad-leaved woodland"* and stated, that the principal tree and bush species are all Zambezian. In both of White's northern and southern variant of the Kalahari thornveld, the legume and savanna genus *Acacia* is most dominant. Rutherford *et al.* (2006) classified the area in South Africa that borders at Botswana near Gaborone and Sebele as *"Dwaalboom Thornveld"*. Due to the short distance from Sebele to the international border, the author assumes, that this vegetation type occurs at the type locality. Its general feature is a layer of scattered, low to medium high, deciduous microphyllous trees and shrubs with a few broad-leaved tree species (the latter are in the middle layer around Sebele) and an almost continuous herbaceous layer dominated by several grass species. Diversity and endemism is low among the flora. The savanna around Sebele is heavily

disturbed today (J. Timberlake, pers. comm.). This is also indicated by the occurrence of the genus *Terminalia* and particularly of *T. sericea* Burch. Characteristic tree species in less disturbed areas are *Acacia erioloba* E. Mey., *A. erubescens* Welw., *A. tortilis* (Forssk.) Hayne ssp. *heteracantha* (Burch.) Brenan, *A. fleckii* Schinz, *Combretum imherbe* Wawra, *Rhus lancea* L. f. and *Ziziphus mucronata* Willd. Tall shrubs comprise, *e.g.*, *Diospyros lycioides* Desf. ssp. *lycioides*, *Euclea undulata* Thunb. and *Grewia flava* DC.

Ecology: *A. sebelensis* spec. nov. is classified as a submontane species. At present, it is associated with a species-poor, legume-dominated savanna (thornveld) including many Zambezian, and hence, tropical elements. Of interest is, that *A. sebelensis* spec. nov. was not yet recorded from any other savanna or from the wide areas of the *„Zambezian regional centre of endemism"*. Only *A. collaris* Aurivillius, which is probably related to *A. sebelensis* spec. nov., has been found at a single locality in a similar habitat further east in the *„Zambezian regional centre of endemism"*. However, *A. sebelensis* spec. nov. is historically not linked to savannas, which are largely tropical, but most probably to an admixture of subtropical and/or temperate forests, woodland and/or thicket vegetation that must have occurred around Sebele before the late Miocene when the oldest finds of typical savanna with its components *Acacia*, Combretaceae, *Commiphora*, *Dichrostachys* are recorded in Africa, and from Namibia in particular (Partridge, 1978). Of interest is in this context, that thornveld developed only *ca.* 10000 years ago (Rutherford *et al.*, 2006).

Distribution: *A. sebelensis* spec. nov. is only known from the type locality. This distribution is indicative for a relict species since typical savanna elements among the Metarbelidae have larger ranges. It's distribution is expected to extand slightly westwards in Botswana and eastwards into South Africa.

***Arbelodes claudiae* spec. nov.**

Plate 3, figures 11, 12; figures 11 a, b; 12 a, b

Material examined: holotype male, N. Malawi, Mzuzu, Nkhorongo, 1375 m, 10.October.2009, R.J. Murphy leg., no genitalia dissection (deposited in the BMNH).

Paratypes: female, N. Malawi, *Juniperus* Forest, 08.-11.October.2003, R.J. Murphy leg., genitalia slide number 19/032010 I. Lehmann (deposited in the author's collection); female, N. Rhodesia, Abercorn, October.1967, I.R.L.C.S. leg., ex NMK, genitalia slide number 17/052008 I. Lehmann (deposited in the NMK); male, same locality, September.1969, I.R.L.C.S. leg., ex NMK, genitalia slide number 29/032008 I. Lehmann (deposited in the NMK); male, same locality, July.1971, I.R.L.C.S. leg., ex NMK, genitalia slide number 30/032008 I. Lehmann (deposited in the NMK); male, same locality, 14.-31.August.1974, Locust Control Centre leg., ex BMNH, B.M. 1975-92, genitalia slide number 03/052010 I. Lehmann (deposited in the BMNH, genitalia slide number BMNH COSS 418); male, N. Malawi, Mzuzu, Nkhorongo, 1375 m, 10.October.1996, R.J. Murphy leg., genitalia slide number 03/012010 I.Lehmann (deposited in the ZMHB); male, same locality, 29.September.2009, R.J. Murphy leg., no genitalia dissection (deposited in the author's collection).

Etymology: the species is named for Dr Claudia Meyer, nee Richter (Bodensee near Göttingen), in recognition of her valuable friendship since March 1988 and in particular for her encouragement to write my diploma thesis in Kenya in 1989.

Description of the male (holotype)

Forewing length 11.0 mm; antenna-wing ratio 0.50:1.

Head: rough-scaled, largely ivory yellow around eyes as well as base of antennae, scales with pure white tips and snuff brown at centre; eyes ecru-olive with small black patches; a pair of small pits on lower part of frontoclypeus is absent, but a pair of small pits occurs behind the upper half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pure white; branches of antennae five to six times width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with one thorn-like scale, branches not bent towards tip of antenna, do not touch each other, distance between branches less than width of branch; labial palpi narrow, less than diameter of eye and densely covered with snuff brown scales and hairs. **Thorax**: patagia and tegulae densely covered with hairs of snuff brown with pure white tips; these white tips form a collar ring on the patagia; a small crest of the same colour on metathorax. **Abdomen**: largely covered with long hairs of ivory yellow and cartridge buff. A long brush of hairs at the end of abdomen, more than half the length of abdomen, resembling a swallow-tail. **Legs**: femora, tibiae and tarsi densely covered

with hairs of pale olive-buff, pure white towards tip; hindlegs with two pairs of very narrow spurs, long, 1.2 mm, overlapping first tarsal joint. **Forewing**: upperside largely old gold; costal margin and termen covered with spots and lunules of old gold edged pure white; a broad pure white subterminal line edged smoke grey towards termen; a narrow pure white postmedial line from costa to CuA_2 which is also pure white; from upper as well as lower end of CuA_2 a pure white line to the dorsum; in the cell is a rounded patch of old gold, edged white; cilia long, 1.1 mm, smoke grey, tips alternating pure white and smoke grey. Underside rough-scaled, pale olive-buff with a broad subterminal band of light greyish olive, edged white towards termen; some small dots in between the light greyish olive subterminal band and termen. **Venation**: cell slightly longer than half the length of wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole protruding upper angle; R_5+R_4+R_3 from top of areole, but not stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell present, but obsolete towards termen. **Hindwing**: upperside pale smoke grey, white towards base of wing; cilia as in forewing, except that all tips are pure white. Underside like in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present, obsolete at centre. **Genitalia**: saccus absent and replaced (?) by a small hook-like structure; tegumen and vinculum fused, forming a firm ring which is broad on its entire length; valvae broad at base, three lobes present; upper lobe narrow and not bent towards uncus, rounded at tip with many setae, scattered longer and shorter setae along its entire length on the ventral as well as dorsal side; lower lobe slightly longer than upper lobe, "leg-shaped" with many long setae ventrally; third lobe in between upper and lower lobe, short, thorn-like with a rounded tip which has long setae; sacculus narrow; uncus elongated, broad, bifid, a small acuminate emargination, many setae ventrally and dorsally towards tips; juxta long and almost rectangular with a large heart-like hole in its upper half; a very broad and large plate-like structure above the juxta. Aedeagus simple, tube-like, longer than length of lower lobe, rounded basally, rounded and broader distally; vesica without cornuti.

Description of the female (ex *Juniperus* forest)

Forewing length 14.0 mm; antenna-wing ratio 0.36:1.

Head: rough-scaled, pale olive-buff, scales mixed with long sepia coloured hairs around eyes as well as base of antennae, eyes wood brown with small black patches; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the upper part of the labial palpi; antennae rather unipectinate than filiform; densely scaled on dorsal side of shaft, ivory yellow with scattered sepia coloured scales; branches less than width of shaft, the two tips on each branch have a thorn-like scale, branches covered with smaller scales of ivory yellow, a few minute hairs ventrally; labial palpi narrow, as long as diameter of eye and covered with colonial buff scales as well as long hairs of sepia. **Thorax**: patagia and tegulae densely covered with hairs of pale olive-buff with white tips; these white tips form – together with sepia coloured hairs – a collar ring on the patagia; a small crest of snuff brown, formed by broader scales, on metathorax. **Abdomen**: not longer than hindwings; largely pale olive-buff. **Legs**: femora, tibiae and tarsi with scales of pale olive-buff, femora and tibiae also with pale olive-buff hairs; hindlegs with two pairs of spurs, narrow, long, 1.0 mm long. **Forewing**: elongated; upperside glossy, pale olive-buff, mixed with scales of light brownish-olive; terminal line and postmedial line broad, light brownish-olive; a small patch of chamois at the end of the cell, edged towards base of wing with a triangular patch of dark olive-buff; below lower median and near the base of wing two patches of dark olive-buff; CuA_2 pure white and from below its centre a rather rounded patch of dark olive-buff, edged pure white towards the dorsum; cilia long, 1.3 mm, pale olive-buff. Underside rough-scaled towards base of wing, pale olive-buff, glossy. **Venation**: cell slightly longer than half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 from lower angle, separated; M_1 from upper angle; areole relatively large, protruding upper angle; R_5+R_4+R_3 from top of areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle

open towards termen; lower angle slightly shorter than upper one; veinlet in cell present, but obsolete towards termen. **Hindwing**: upperside glossy, light brownish olive; cilia and underside as in forewing; frenulum absent. **Venation**: cell about half the length of the wing; 3A present, 1A+2A obsolete, CuP present; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a short stalk and emerging from upper angle; no bar to $Sc+R_1$, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: abdominal segment 9 broad, gap on the ventral side broad and elongated, the length of this gap is almost half of the length of the segment; posterior edge densely covered with setae only towards the ventral part; posterior apophyses very broad and of six times the length as anterior apophyses; anterior apophyses short, not S-shaped, tip rounded; papillae anales very broad and large, elliptic, obliquely 8-shaped towards the rounded tip, covered with long and short setae.

Diagnosis: *A. collaris* Aurivillius, *A. prochesi* spec. nov., *A. sebelensis* spec. nov., *A. claudiae* spec. nov. and *A. griseata* (Janse) are similar. Differences exist in the male genitalia, which separate *A. claudiae* spec. nov. and *A. griseata* (Janse) from *A. collaris* Aurivillius and *A. prochesi* spec. nov. Both former species have three lobes and a thorn-like, acuminate costa at the base of the upper lobe, while the latter two species have two lobes. It is of interest, that two long lobes and a short lobe in between are currently only known from *A. claudiae* spec. nov. and *A. griseata* (Janse), occurring in northeastern Zambia/northern Malawi and in northeastern South Africa, respectively. The female postabdominal structure of *A. claudiae* spec. nov. has two peculiar characters, resembling the female of *A. sebelensis* spec. nov.: Firstly, the anterior apophyses are very short. Secondly, the posterior apophyses are very large and among the largest of the Metarbelidae. The gap on the ventral side is also very broad and elongated in both *A. sebelensis* spec. nov. and *A. claudiae* spec. nov.

Habitats: Firstly, Nkhorongo is a suburb of Mzuzu (North Malawi) which is located at 1255 m (average annual rainfall 1300 mm) in the *"Zambezian regional centre of endemism" sensu* White (1983). The North Vipya Plateau is separated from the South Vipya by a belt of wooded country at lower altitude (1220-1370 m) surrounding Mzuzu. Average rainfall on the North Vipya exceeds 1525 mm only on the high plateau where forests grow at altitudes above 1830 m. Below 1525 m, as around Mzuzu, *"Zambezian miombo woodland"* occurs. This was once the main vegetation type of the Central African Plateau and its escarpments. It is nearly always dominated by woody legumes, namely species of *Brachystegia*, either alone or with *Julbernardia* and/or *Isoberlinia*. On the Vipya plateaus *Brachystegia* woodland is sometimes intermediate in its physiognomy in between forest and woodland. In wetter miombo (average annual rainfall > 1000 mm), *e.g., Brachystegia taxifolia* Harms, *B. floribunda* Benth., *B. spiciformis* Benth., *Julbernardia paniculata* (Benth.) Troupin and *Isoberlinia angolensis* (Benth.) Hoyle & Brenan are present. Noteworthy is that close to Mzuzu the Afromontane near-endemic *Trichocladus ellipticus* Eckl. & Zeyh. occurs, a species more typical of lowland and submontane rain forest. The collecting site is floristically diverse and includes *ca.* 80 tree and shrub species. Dominant trees are *Brachystegia taxifolia* Harms, *B. bussei* Harms, *B. utilis* Burtt Davy & Hutch. and *Uapaca guineensis* Müll. Arg., which is a Guineo-Congolian linking species (R. J. Murphy, pers. comm.).

Secondly, the *Juniperus* forest, dominated by the Afromontane endemic *Juniperus procera* Hochst. ex Endl., is located on the Nyika Plateau (North Malawi) at an altitude of 2130-2220 m with an average annual rainfall of 1000-1400 mm (*e.g.,* 1062 mm at Chelinda *ca.* 14 km northwest from the *Juniperus* forest, but 2344 mm towards the top of the eastern escarpment at Kassaramba *ca.* 12 km northeast at an altitude of 2440 m). The forest area belongs to the *"Afromontane archipelago-like regional centre of endemism" sensu* White (1983). The *Juniperus* forest is mostly confined to the apparently dry Uyaghaya Valley in the southeast of the Nyika Plateau. There are several small and isolated patches covering a total area of *ca.* 30 ha, the largest patch is 9 ha. All patches belong to a variant of the *"Undifferentiated Afromontane forest" sensu* White (1983). *Juniperus procera* Hochst. ex Endl. and *Olea capensis* L. emerge to a height of 30-35 m above the broad-leaved canopy of 20-25 m. The latter includes tree species such as *Apodytes dimidiata* E. Mey, *Cassine aethiopica* Thunb., *Cassipourea malosana* (Baker) Alston, *Chionanthus battiscombei* (Hutch.) Stearn, *Halleria lucida* L and the uncommon Afromontane endemic *Casearia battiscombei* R.E.Fr. Small trees of 10 m or less include *Gnidia glauca* (Fresen.) Gilg, and tall shrubs are represented by, *e.g.*, *Dovyalis macrocarpa* Bamps. Along the forest edge occur Afromontane endemics as small shrubs of *Agelanthus bipartitus* Balle, *Achyrospermum cryptanthum* Baker and *Plectranthus sylvestris* Gürke. The small tree *Myrica*

serrata Lam. was recorded near the *Juniperus* forest (all species were compiled from White *et al.*, 2001). The collecting site of *A. claudiae* spec. nov. was located within the *Juniperus* forest at an altitude of *ca.* 2215 m. Nearby are secondary (?) montane grasslands, probably a type of wooded grassland, with grasses of *Loudetia simplex* (Nees) C.E. Hubb. and *Monocymbium ceresiiforme* (Nees) Stapf including small trees of the genera *Erica* and *Protea* (R.J. Murphy, pers. comm.).

Thirdly, Mbala (formerly called Abercorn; altitude 1676 m; average annual rainfall 1240 mm) is located in northeastern Zambia (Northern Province) on the Central African Plateau. The area belongs to the *"Zambezian regional centre of endemism" sensu* White (1983). From Mbala the plateau falls away through a series of escarpments to the shores of Lake Tanganyika, *ca.* 20 km northwest from Mbala, at an altitude of *ca.* 850 m. This area, including Mbala, is part of the Lake Tanganyika Basin. Although Mbala was a station for the International Red Locust Control Service (I.R.L.C.S.), it was not an area with a permanent population of the Red Locust which occurs in large grass areas (Backlund, 1955). According to Lawton (1963, 1978) as well as to Smith & Trapnell (2002) occur five distinct vegetation types around Mbala, largely associated with different soils: Firstly, miombo woodland including stands with more open canopies resulting in a high-grass woodland with *Erythrophloeum africanum* (Welw.) Harms and *Pterocarpus angolensis* DC.; secondly, two distinct types of "chipya-woodland", *e.g.*, with *Parinari curatellifolia* Planch., *Pterocarpus angolensis* DC., *Burkea africana* Hook.; thirdly, undifferentiated *Brachystegia-Isoberlinia* woodlands; fourthly, *Diplorrynchus* scrub-grassland on ironstone soils and soils on the plateau and fifthly, small remnants of tropical moist forest as well as riparian forest (known locally as "mushitu"). The miombo woodlands cover most of the surroundings of Mbala and were classified by Chidumayo (1997) as *"northern wet miombo"*. The most common canopy dominants include according to Lawton (1963), *e.g.*, *Brachystegia spiciformis* Benth., *B. utilis* Burtt Davy & Hutch., *B. floribunda* Benth., *B. wangermeeana* De Wild, *B. allenii* Burtt Davy & Hutch., *Julbernardia paniculata* (Benth.), *Isoberlinia angolensis* (Welw.) Hoyle & Brenan, *Albizia antunesiana* Harms, *Pericopsis angolensis* (Baker) Meeuwen and *Marquesia macroura* Gilg. Chipya is regarded as a mosaic of different stages of degradation/re-establishment of evergreen tropical forest that appears as fragments of evergreen thicket, known locally as "mateshi" (climbers and lianas present; miombo dominants absent). Chipya has a tall and dense grass cover as well as a luxuriant herbaceous component. It is basically a fire-climax vegetation type derived from forest patches on nutrient-rich soils of lake basins and on red soils on the plateau (J. Golding, pers. comm.). In some areas of the Northern Province occur large mushitu as around Mbala. They have an interesting floristic composition and comprise species occurring also in the Guineo-Congolian Region as swamp forest species, *e.g.*, *Mitragyna stipulosa* (DC.) Kuntze, *Syzygium owariense* (P.Beauv.) Benth., *Uapaca guineensis* Müll. Arg. and *Xylopia aethiopica* (Dunal) A.Rich.; as well as moist tropical forest species, *e.g.*, *Antiaris toxicaria* Lesch., *Synsepalum brevipes* (Baker) T.D.Penn., *Vitex doniana* Sweet, *Erythrophleum suaveolens* (Guill. & Perr.) Brenan. Afromontane species are also represented as the Afromontane near-endemic *Ocotea usambarensis* Engl. Another relict of a moist tropical forest near Mbala is Siszya Forest, located near the shores of Lake Tanganyika and near Kalambo Falls (08o39'S, 31o16'E; J. Timberlake, pers. comm.). It has dominant species of *Celtis africana* Burm.f., *Pouteria altissima* (A.Chev.) Baehni, that occurs in West-, Central and East Africa, as well as *Pouteria adolfi-friedericii* (Engl.) A. Meeuse, an Afromontane endemic. Trapnell (1943) postulated that chipya occurs on areas formerly occupied by evergreen forest/thicket and Lawton (1963) treated the mushitu and moist tropical forest remnants as relicts of the once extensive pan-African lowland rain forest, and hence, as Pleistocene forest refugia.

Ecology: *A. claudiae* spec. nov. is classified as a montane species. It is associated with isolated remnants of *Juniperus* forest, dominated by Afromontane endemics, as well as with species-rich, legume-dominated miombo that is mixed with distinct types of chipya including evergreen forest/thicket patches. Near Mbala, the miombo borders locally at riparian forests, comprising together with Siszya Forest and other remnants near Kalambo Falls, Pleistocene forest refugia. *A. claudiae* spec. nov. is historically not linked to miombo, but most probably to subtropical and/or temperate Afromontane and/or evergreen forest types. There are, for example, still relict populations of *Oreobambus buchwaldii* K. Schum. around Mzuzu as well as of *Podocarpus latifolius* (Thunb.) Mirb. on the North and South Vipya plateaus. On the Nyika Plateau, montane forests were once much more extensive. This is indicated, *e.g.*, in the eastern part of the plateau where the latter species and *P. henkelii* Stapf are still locally common. Around Mbala, *Oreobambus buchwaldii* K. Schum. still occurs in a gorge on a hill (Lawton,

1963). Hence, there are relict populations of Afromontane, and hence, temperate plant species in all three localities where *A. claudiae* spec. nov. has been recorded.

Distribution: *A. claudiae* spec. nov. is only known from upland areas in northern Malawi as well as northeastern Zambia. This is indicative for a disjunct and relict distribution. It is expected to extand slightly northeastwards into adjacent areas of Tanzania, which is only 25 km from Mbala.

The area around Mbala currently represents the northern distribution limit of the genus *Arbelodes*.

Arbelodes griseata (Janse, 1925), **comb. nov.**

Plate 3, figure 13; figures 13 a, b

Original combination: *Metarbela griseata* Janse, 1925

Synonyms: None

Holotype: male, S.A., Transvaal, Pretoria, 19.October.1915, A.J.T. Janse leg., deposited in TMSA.

Material examined: male, S.A., Transvaal, Pretoria, W. Elandsfontein, 04.October.1967, D.W. Rorke leg., ex TMSA, genitalia slide number 16/022010 I. Lehmann (deposited in the TMSA); male, S.A., Northwest Province, Rustenburg, Natuurreservaat, 3.-6.November.1975, Potgieter & Scoble leg., ex TMSA, genitalia slide number 28/082008 I. Lehmann (deposited in TMSA).

Description of the male (ex Rustenburg)

Forewing length 10.0 mm; antenna-wing ratio 0.50:1.

Head: rough-scaled, glossy, long hairs of sepia with tips of olive-buff around eyes as well as base of antennae, eyes black; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the upper half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales ivory yellow; branches of antennae five times width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with one long thorn-like scale, branches not bent towards tip of antenna and do touch each other only slightly, distance between branches narrow, less than width of branch; labial palpi narrow, short, less than diameter of eye and densely covered with long hairs of sepia. **Thorax**: patagia and tegulae densely covered with glossy hairs of ivory yellow, some hairs with sepia coloured tips which form a collar ring; a small crest of hairs of ivory yellow with buckthorn brown tips on metathorax. **Abdomen**: largely olive-buff mixed with ivory yellow. A brush of hairs at the end, less than half the length of abdomen. **Legs**: femora, tibiae and tarsi densely covered with hairs of deep olive-buff, mixed with sepia on tibiae; hindlegs with two pairs of narrow spurs, long, 1.0 mm, inner spur slightly shorter, overlapping first tarsal joint. **Forewing**: upperside ecru-olive; costal margin and termen covered with spots and lunules of deep olive-buff, especially at the end of veins, alternating with ivory yellow; terminal and subterminal line buffy-olive; a small spot of sepia in the cell, edged ivory yellow towards termen; lower median and CuA_2 sepia; two large pure white patches below CuA_2, a sepia coloured patch near base of wing and below lower median; all three patches do not extend to the dorsum; cilia short, 0.8 mm, olive-buff with deep olive-buff tips. Underside rough-scaled towards base of wing, ecru-olive, glossy. **Venation**: cell slightly longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole protruding upper angle; R_5 from below areole, R_4+R_3 from top of areole, long stalked (note: this is a variable character since the stalk is absent in a male from Pretoria); R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell obsolete towards base of wing. **Hindwing**: upperside ecru-olive, glossy; cilia as in forewing. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present, obsolete towards base of wing. **Genitalia**: saccus short; tegumen and vinculum fused, forming a firm ring which is broad on its entire length; valvae broad at base, three lobes present; upper lobe narrow, bent towards uncus, rounded at tip with many setae; lower lobe slightly longer than upper lobe, bent towards the ventral side, many long setae

near its base ventrally; third lobe in between upper and lower lobe, short, thorn-like in shape but with a rounded tip which has many setae; sacculus narrow; uncus broad (ventral view), elongated, slightly bifid with a small acuminate emargination, setae ventrally towards tips; juxta broad with a deep and wide emargination, horn-like with rounded tips; a broad plate-like structure above the juxta. Aedeagus simple, tube-like, very long, 1.5 times longer than lower lobe, rounded basally, rounded and broader distally; vesica without cornuti.

Diagnosis: *A. griseata* (Janse) is related to *A. claudiae* spec. nov. Despite many similarities (*cf.* diagnosis above), a difference between both species is the very long aedeagus in *A. griseata* with a swallow-tail distally (its longer than the length of the ventral lobe). Other species with a very long aedeagus are *A. meridialis* Karsch, *A. sticticosta* (Hampson), *A. flavicolor* (Janse), *A. albitorquata* (Hampson) and *A. deprinsi* spec. nov., but none of those species has two long lobes and a short one in between.

Habitat (examples) : Firstly, the Rustenburg Nature Reserve (*ca.* 4300 ha; today called Kgaswane Mountain Reserve) is located behind Rustenburg's southern suburbs (altitude 1153 m; mean annual rainfall 650 mm; rainfall very variable) *ca.* 90 km west from Pretoria, in the North West Province. The Rustenburg area lies just north of a line between Pretoria and Mafeking (South Africa) and hence, it still belongs to the *"Zambezian regional centre of endemism" sensu* White (1983). The reserve is surrounded by the fast growing town Rustenburg, by agricultural lands (formerly a strong source for the supply of citrus products) as well as by mining activities. It is dominated by the rocky ridges of the western Magaliesberg Mountain Range. This mountain range extends in an arc-like feature for *ca.* 125 km roughly from west of Pretoria to northwest of Rustenburg. The "Amphitheater" of the Magaliesberg has an altitude of 1741 m. South of Rustenburg is an inselberg of 1325 m. Both indicate that the altitude range within the reserve is between 1200 and 1600 m. The main vegetation type on the Magaliesberg Mountain Range between 1200 and 1741 m is *"Gold Reef Mountain Bushveld" sensu* Rutherford *et al.* (2006). It is characterized by often west-east trending rocky hills and ridges with dense woody vegetation often on south-facing slopes. Tree and shrub layers are often continuous; the herbaceous layer is dominated by grasses, including succulent herbs like the endemic *Frithia pulchra* N.E. Br. Dominant tree species comprise *e.g.*, *Acacia caffra* (Thunb.) Willd., *Protea caffra* Meisn., *Celtis africana* Burm. f., *Vangueria infausta* Burch. and *Ziziphus mucronata* Willd. Shrubs include *Canthium gilfillanii* (N.E. Br.) O.B. Mill., *Grewia occidentalis* L., *Rhus magalismontana* Sond. and the endemic succulent *Aloe peglerae* Schönland. North and south of the Magaliesberg Mountain Range occurs *"Moot Plains Bushveld" sensu* Rutherford *et al.* (2006), especially south of Rustenburg, and probably on smaller areas within the reserve at an altitude range of 1050-1450 m. It comprises in contrast to the vegetation type mentioned above thorny savannas that are dominated by various species of *Acacia*, like *A. nilotica* (L.) Willd. ex Delile, *A. tortilis* (Forssk.) Hayne as well as by *Olea europaea* L. Shrubs include, *e.g., Grewia occidentalis* L. and *Gymnosporia polyacantha* (Sond.) Szyszyl. Both vegetation types described above indicate that there is, at present, a weak link to the flora of the Afromontane Region.

Secondly, Pretoria (altitude 1369 m; average annual rainfall 783 mm) belongs to the *"Zambezian regional centre of endemism" sensu* White (1983) and is surrounded by subtropical savannas of the Central Bushveld, with a continuum between shrubs and trees with no distinct layer. Although the exact localities of the collecting sites of several specimens of *A. griseata* are unknown, it is of interest here, that a direct link exists between Pretoria and the Rustenburg area via the *"Gold Reef Mountain Bushveld"* which begins in a narrow band east of Pretoria and surrounds the town in the north before it is broadening on the Magaliesberg Mountain Range westwards (*cf.* above). A second, and much broader link, exists via the *"Marikana Thornveld"* sensu Rutherford *et al.* (2006) which is an open woodland dominated by *Acacia karroo* Hayne. It occurs on plains and in valleys from the Rustenburg area in the west to Pretoria in the east where this vegetation type surrounds the town in a broad band in the north, east and southeast.

Elandsfontein is a suburb of Pretoria, located west from the town, and close to parallel ranges of hills which extend from Hartebeespoort Dam in the west to Atteridgeville in the east. This area is covered with bands of *"Gold Reef Mountain Bushveld"*, *"Moot Plains Bushveld"* and *"Andesite Mountain Bushveld"* (1350-1800 m) *sensu* Rutherford *et al.* (2006). The latter is a dense, medium or tall thorny bushveld with a well developed grass layer. Important tree species include *Acacia caffra* (Thunb.) Willd., *A. karroo* Hayne, *Protea caffra* Meisn., *Celtis africana* Burm. f., *Ziziphus mucronata* Willd. and

Zanthoxylum capense (Thunb.) Harv. Common shrub species comprise, *e.g.*, *Asparagus laricinus* Burch., *Euclea crispa* (Thunb.) Gürke and *Lippia javanica* (Burm. f.) Spreng.

Thirdly, Shilovane (also spelled Shilouvane; average annual rainfall 450-550 mm) was mentioned by Janse (1925) as the collecting site of a paratype recorded by Junod in November, 1902. It is located *ca.* 25 km southeast of Tzaneen, namely near Ofcolaco and The Downs (*ca.* 14 km southeast of Serata Peak, 2050 m). Shilovane is a small settlement including the old mission station (established in 1886) where Reverend Junod worked. The mountain adjacent to this site is the Wolkberg, a local name for the north-eastern Drakensberg escarpment near Tzaneen. This escarpment region, and in particular its grasslands, were found to be very rich in endemic plant and butterfly species, and hence, Matthews *et al.* (1993) proposed to name this region the „Wolkberg Centre". The predominant vegetation types on the eastern side of the north-south oriented Wolkberg-Drakensberg are the *„Granite Lowveld"* and the *„Tzaneen Sour Bushveld" sensu* Rutherford *et al.* (2006). The former occurs at an altitude of 250-700 m and is characterized by *Dichrostachys cinerea* (L.) Wight & Arn., *Combretum hereroense* Schinz, *Strychnos madagascariensis* Poir., few trees of *Acacia nigrescens* Oliv., *A. nilotica* (L.) Willd. ex Delile and *Albizia harveyi* E. Fourn. *„Tzaneen Sour Bushveld"* occurs at altitudes of 600-1000 m and higher in places. The average annual rainfall is above 550 mm. It is a tall open bushveld (parkland) with a tall grass layer on the lower and middle slopes of the northeastern escarpment. Several of the important tree species are woody legumes as *Pterocarpus angolensis* DC., *Acacia polyacantha* Willd. (a subtropical element), *Albizia versicolor* Welw. ex Oliv., and *Pterocarpus rotundifolius* (Sond.) Druce. *Ficus* species are diverse. Many areas have been transformed by afforestation (higher-lying parts) and agriculture (lower-lying areas) during the 1980's. Of interest is the *„Soutpansberg Centre of endemism"*, *ca.* 110 km north from Ofcolaco, including 30 % of all tree species as well as *ca.* 3000 vascular plant species that occur in southern Africa. The very heterogeneous savanna vegetation and patches of Afromontane forests, share both, especially at higher-lying areas (975-1465 m), floristic elements with the Magaliesberg Mountain Range (Mostert *et al.*, 2008).

Ecology: *A. griseata* is classified as a montane species. The present data shows, that it is associated with higher-lying, moist/dystrophic, subtropical savannas of the Central Bushveld, and apparently less, with lower-lying, arid/eutrophic savannas of the Lowveld. The former are dominated by woody legumes of the Mimosoideae and belong to the South African section of the *"Zambezian regional centre of endemism"*; the latter are broad-leaved savannas on the African erosion surface. These southern African savannas, which are relatively depauperate in regard to their floristic diversity, are transitional between the tree and shrub flora, that is mainly Sudano-Zambezian in the upper layers, but the lower layers have strong affinities with the Karoo-Namib Region (Rutherford *et al.*, 2006). Hence, the habitats of *A. griseata* are located in savannas that are different to miombo (which, *e.g.*, are tropical and have a distinct tree layer with woody legumes of the Caesalpinioideae) as well as to those tree savannas often overwhelmingly dominated by *Colophospermum mopane* (J. Kirk ex Benth.) J. Léonard. The latter occur in the Limpopo Province, for example, north of the Soutpansberg Mountains.

Distribution: *A. griseata* is known only from South Africa where it has been recorded in the Gauteng, North-West and Limpopo provinces. Its southern limit is currently the Magaliesberg Mountain Range. It extends from there northeastwards to the eastern side of the Wolkberg-Drakensberg (Shilovane) and very likely further north to the Blouberg-Soutpansberg Mountain Range. Janse (1925) mentioned a fourth locality, namely Rietfontein in the „Zoutpansberg District". The identity of this place remains uncertain, and Rietfontein is at best presumtive to be east of the Waterberg near Naboomspruit (Limpopo Province). It is treated here as a potential endemic species of South Africa.

Arbelodes mondeensis spec. nov.

Plate 3, figure 14; figures 14 a, b

Material examined:

Holotype: male, S.A., Eastern Cape, Bathurst District, Kleinemonde, December.1949, J. Omer Cooper leg., ex TMSA, genitalia slide number 23/082008 I. Lehmann (deposited in the TMSA).

Paratype: male, S.A., same locality, January.1950, J. Omer Cooper leg., no genitalia dissection (deposited in the TMSA).

Etymology: the species is named from the type locality Kleinemonde.

Description of the male (holotype)

Forewing length 8.5 mm; antenna-wing ratio 0.53:1.

Head: small with an elongated shape; rough-scaled, glossy, long hairs of ivory yellow around eyes as well as base of antennae, eyes black, almost as large as the head; a pair of small pits on lower part of frontoclypeus absent, but a pair of pits occurs behind the lower half of the labial palpi; antennae (missing in the paratype) bipectinate, scaled on shaft and dorsal side of branches, scales ivory yellow; branches of antennae five times width of shaft, narrow, covered with long hairs, two times width of branch, hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches S-shaped and not bent towards tip of antenna, do not touch each other; distance between branches narrow, slightly more than the width of the branch; labial palpi narrow, short, less than diameter of eye and densely covered with ivory yellow hairs as well as scales. **Thorax**: patagia and tegulae glossy, densely covered with hairs of light brownish-olive that are ivory yellow towards base; a crest of glossy, light brownish-olive hairs with broad, triangular tips of deep purplish vinaceous on metathorax. **Abdomen**: glossy, light brownish-olive; an abdominal tuft, that resembles a swallow-tail, is present and has almost the same length as the abdomen. **Legs**: femora, tibiae and tarsi densely covered with hairs of light brownish-olive; hindlegs with two pairs of narrow spurs, long, 1.0 mm, overlapping first tarsal joint. **Forewing**: apex rounded, upperside glossy, light yellowish-olive; a broad, triangular terminal band of Dresden brown, edged by a wave-like line of ivory yellow, from costa to tornus; costal margin with sepia coloured spots, termen Dresden brown; a small, but faded spot of sepia in the cell; two prominent, rounded spots of orange-buff, edged Dresden brown, below lower median and below CuA_2; two small and faded spots, maybe orange-buff in fresh specimens, near tornus; cilia short, 0.5 mm, Dresden brown with a vinaceous gloss. Underside rough-scaled towards base of wing, buffy brown, glossy. **Venation**: cell slightly longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole small, not protruding upper angle; R_5+R_4+R_3 from top of areole, long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled slightly inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell present. **Hindwing**: upperside light yellowish-olive with a vinaceous gloss; a broad band of Dresden brown covering the entire outer half of the wing; cilia as in forewing. Underside rough-scaled towards base of wing, buffy brown, glossy; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A present with a strong, oblique fold, CuP absent; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present, obsolete towards base of wing. **Genitalia**: saccus short, triangular with a rounded tip; tegumen and vinculum fused, forming a firm ring which is narrow at centre; valvae broad at base, three lobes present, all have a similar length and are very narrow; upper lobe bent towards uncus; the end of the central lobe is brush-like covered with scale-like structures; lower lobe bent towards the ventral side; a valval apodeme present above the juxta; sacculus small, narrow; uncus broad (ventral view), elongated, bifid, tips acuminate with tiny setae, a wide rounded emargination in between the tips, many setae at base of uncus; juxta small, horn-like with a deep emargination in between the two "horns". Aedeagus simple, tube-like, narrow, very long, extending from saccus well beyond the lobes, rounded basally, resembling a swallow-tail distally; vesica without cornuti.

Diagnosis: *A. mondeensis* spec. nov has the defining characters (apomorphies) of the genus *Arbelodes*. Due to unique characters, its closest related species is unknown at present. The following characters are outstanding: Firstly, the orange-buff spots on the forewing upperside are a very rare colour that is currently only known from two undescribed *Metarbela* species from West Africa and from *A. flavicolor*. Secondly, the areole on the forewing is very small if compared to other *Arbelodes* species (similar in *A. flavicolor*). Thirdly, there are three long, very narrow, elongated lobes with scale-like structures on their tips. Fourthly, the aedeagus is currently the longest among the *Arbelodes* if compared to the width of the genitalia (similar in *A. flavicolor* and *A. sticticosta*). The three-lobed genitalia of *A. kroonae* Lehmann (2007) from southern Namibia has thicker lobes and very long setae on the lower lobe; scale-like structures are entirely absent.

Habitat: Kleinemonde (altitude 0–73 m; mean annual rainfall 592 mm) is a small settlement located in the Eastern Cape Province, *ca.* 14 km northeast from Port Alfred, close to the shoreline of the Indian Ocean as well as to the Kleinemonde

River. The area belongs to the *"Tongaland-Pondoland regional mosaic" sensu* White (1983) and to the *"Albany Centre"* of plant endemism *sensu* Van Wyk & Smith (2001). Along the Kleinemonde River occurs *"Kowie Thicket" sensu* Hoare *et. al.* (2006). This is the major floristic node of the Albany Centre with subtropical elements and occurs around the settlement Kleinemonde as well as up to 1 km further inland from the shoreline of the Indian Ocean. It is a tall thicket dominated by succulent euphorbias and aloes with a thick understorey composed of thorny shrubs and woody lianas. Important tree species include *Euphorbia grandidens* Haw., *Aloe africana* Mill., the woody legume *Schotia afra* (L.) Thunb. var. *afra*, *Cussonia spicata* Thunb. and *Acacia natalitia* E. Mey. Much of the area around the Kleinemonde estuary is covered by the *"Albany Coastal Belt" sensu* Hoare *et. al.* (2006). This is a mosaic of natural and post-disturbance successions, dominated by solitary *Acacia natalitia* E. Mey. trees as well as by a short grassland with scattered clumps of trees and bush. The latter includes woody legumes and many endemics (mainly succulent herbs). Important species comprise trees such as *Erythrina caffra* Thunb., *Zanthoxylum capense* (Thunb.) Harv., *Euphorbia triangularis* Desf. and the endemic shrub *Bergeranthus concavus* L. Bolus.

Ecology: *A. mondeensis* spec. nov. is classified as a lowland species. Since its habitat is associated mainly with thickets and tree clumps comprising subtropical and temperate elements, including woody legumes, *A. mondeensis* spec. nov. is probably transitional with subtropical and temperate affinities. It is interesting to note, that the few relationships to three other *Arbelodes* comprise only species which have been found in Afrotemperate forests of the Cape Floristic Region as well as in the Great Escarpment-Drakensberg.

Distribution: *A. mondeensis* spec. nov. is known only from the type locality. It is classified as an endemic species of the Albany Centre due to its peculiar characters. This view is supported by the fact, that its habitat is linked to the *„Kowie Thicket"* which represents the major floristic node of this centre of endemism.

Arbelodes iridescens (Janse, 1925)

Plate 3, figure 15; figures 15 a, b

Original combination: *Metarbela iridescens* Janse, 1925

Synonyms: None

Holotype: male, S.A., Waterval Onder, 19.November.1910, A.J.T. Janse leg., deposited in TMSA.

Material examined: male, S.A., Transvaal, Pretoria N., 09.October.1944, G. van Son leg., ex TMSA, genitalia slide number 27/022010 I. Lehmann (deposited in the TMSA).

Note: There is one additional male in the TMSA collected by van Son in Pretoria in September 1949. No further records.

Description of the male (ex Pretoria)

Forewing length 12.5 mm; antenna-wing ratio 0.52:1.

Head: rough-scaled, glossy, deep colonial buff mixed with long hairs of sepia around eyes as well as base of antennae, eyes black; a pair of small pits on lower part of frontoclypeus absent, but a pair of pits occur behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pale olive-buff; branches of antennae seven times width of shaft, narrow, covered with long hairs (two times width of branch), hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches not bent towards tip of antenna, and hence, do not touch each other towards its tip; distance between branches two times width of branch; labial palpi long, as long as diameter of eye and densely covered with colonial buff scales mixed with hairs of Natal brown. **Thorax**: patagia glossy, densely covered with hairs of pale olive-buff and ivory yellow, tips Natal brown, forming a collar ring; tegulae glossy, pale olive-buff mixed with ivory yellow; a small crest of pale olive-buff and ivory yellow hairs with elongated, triangular tips of Natal brown on metathorax. **Abdomen**: pale olive-buff, mixed with hairs of ivory yellow and Natal brown. A short abdominal tuft at the end. **Legs**: femora, tibiae and tarsi densely covered with long, glossy hairs of ivory yellow and colonial buff; hindlegs with two pairs of narrow spurs, long, upper pair 1.0 mm, lower pair 1.2 mm, with an acuminate tip, overlapping first tarsal joint. **Forewing**: upperside glossy, pale olive-buff with a broad, white terminal band that is dissected by lines of citrine drab, forming white rounded patches; upper end of cell pure white, extending to the costal margin with a prominent small spot of Natal brown in its centre; below lower median and CuA_2 four white patches, edged Natal brown; two patches below the lower

median are connected by a somewhat paler band with the white patch near the costa; a wave-like line of Natal brown from costa to the end of CuA_2; cilia glossy, long, 1.1 mm, alternating pure white and citrine drab. Underside rough-scaled from half of wing towards its base, pale olive-buff, glossy. **Venation**: cell slightly longer than the half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 not well separated and from lower angle; M_1 from upper angle; areole elongated, slightly protruding upper angle; R_5+R_4+R_3 from top of areole, long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle shorter than upper one, veinlet in cell present. **Hindwing**: upperside citrine drab, glossy; cilia as in forewing. Underside rough-scaled towards base of wing, pale olive-buff, glossy; frenulum absent. **Venation**: cell shorter than half length of the wing; 3A present, 1A+2A present, CuP rudimentary; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated, M_2 with a very small fork; M_1 and Rs on a short stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled strongly inwardly, lower angle shorter than upper angle, veinlet in cell present. **Genitalia**: saccus rudimentary; tegumen and vinculum fused, forming a firm ring which is broad on its entire length, tegumen with a pair of tiny thorns on each side; valvae broad at base, two lobes present, narrow, upper lobe long, claw-like with tiny setae at the rounded tip, not bent towards uncus; lower lobe narrow, thorn-like, a few tiny setae along its edges; a small valval apodeme present above the juxta; sacculus small, narrow; uncus short, broad (ventral view), with a hole near its base, bifid, tips acuminate with tiny setae, in between the tips a wide rounded emargination; a few setae at the base of uncus; juxta broad with a deep emargination. Aedeagus simple, tube-like, narrow, short, slightly shorter than the length of lower lobe, rounded basally and distally; vesica without cornuti.

Diagnosis: *A. iridescens* shares some characters that are similar in species occurring along the Great Escarpment-Drakensberg and in the Western Cape Province. This fact separates it from those species occurring west of Pretoria (*A. griseata*, *A. sebelensis* spec. nov.) as well as further north in the Zimbabwean Highlands, eastern Zambia and northern Malawi (*A. prochesi* spec. nov., *A. claudiae* spec. nov.). An interesting character is a large valval apodeme in combination with two lobes. Such a combination has been seen only in *A. sticticosta*, which occurs sympatrically with *A. iridescens* in Waterval Onder, as well as in *A. haberlandorum* spec. nov. from the Cederberg (see below). All three species have also a similar antenna-wing ratio of 0.50:1 in *A. sticticosta*, 0.52:1 in *A. iridescens* and 0.54:1 in *A. haberlandorum* spec. nov., respectively. Major differences of the latter species, if compared to *A. sticticosta* and *A. iridescens*, comprise: Firstly, a wing pattern is absent, but the latter two species have a geometric design on the forewing upperside. Secondly, M_1 and Rs are not long stalked in the hindwing. Thirdly, the uncus is less elongated with a hole at its base only in *A. iridescens*. The broad vinculum and an aedeagus that has distally an end which resembles a swallow-tail, occurs in *A. sticticosta* and in *A. haberlandorum* spec. nov. However, these differences between the three species are probably less significant, but the occurrence of a valval apodeme in combination with two lobes appears to be a complex character. This suggests that *A. iridescens*, *A. sticticosta* and *A. haberlandorum* spec. nov. are related. Nevertheless, *A. sticticosta* is closest related to *A. meridialis* due to the very long saccus, which has not been seen in any other *Arbelodes*.

Habitats: The habitat description for Pretoria was presented above (*cf. A. griseata*).

Waterval Onder (altitude 1200–1350 m; average annual rainfall 1100-1200 mm) is located in the north-central part of the Mpumalanga Province *ca.* 170 km east from Pretoria. The area is part of the northern Drakensberg and hence, it belongs to the *"Afromontane archipelago-like regional centre of endemism" sensu* White (1983). The environment comprises high-altitude plateaus, hills and deep valleys of the *"Lydenburg Montane Grassland" sensu* Mucina *et al.* (2006) with predominantly low grasslands, including small trees and low shrubs. The flora is Afromontane with links to the Zimbabwean Highlands as well as to the southern Drakensberg. The number of endemic species among the shrubs and herbs is high. Small patches of Northern Mistbelt Forest and shrub-like thickets are common. Forest patches occur particularly northeastern of Waterval Onder. This is of interest, since the two closest related species were found in forests and thickets. Small trees in the grasslands, which largely surround Waterval Onder, include, *e.g.*, *Protea roupelliae* Meisn. ssp. *roupelliae* and *Faurea galpinii* E. Phillips. Endemics occur particularly among low shrubs, *e.g.*, the genus *Helichrysum* as *H. mariepscopicum* Hilliard.

Ecology: *A. iridescens* is classified as a montane species. Its habitat is associated with forests and thickets of the Afromontane Region which are embedded in grasslands. It is interesting to note, that two related species, namely *A. sticticosta* and *A. haberlandorum* spec. nov., are known only from forests and thickets. Both have been found in Afromontane areas of the Drakensberg or in the Cape Floristic Region. The occurrence of *A. iridescens* in the *"Zambezian regional centre of endemism"* as around Pretoria, and hence in southern African savannas, is not surprising since the largest part of the Grassland Biome boundary in South Africa interfaces with the Savanna Biome. Pretoria is located at such a boundary.

Distribution: *A. iridescens* is known only from northeastern South Africa, namely from the Gauteng and Mpumalanga provinces. It is classified as an endemic species of South Africa, in particular of the Great Escarpment-Drakensberg and its transitional areas, for example, the Sub-Escarpment Savanna region as well as higher-lying areas of the Central Bushveld.

***Arbelodes haberlandorum* spec. nov.**

Plate 3, figure 16; figures 16 a, b

Material examined: holotype male, S.A., Western Cape Province, Cederberg, Algeria, Farm Jamaka, Rondegat River, 21.March.2005, W. Mey leg., ex ZMHB, genitalia slide number 23/012010 I. Lehmann (deposited in the ZMHB).

Paratype male, S.A., Western Cape Province, Cederberg, Algeria Forestry Station, 04.-10.March.1969, Potgieter & Strydom leg., ex TMSA, genitalia slide number 21/052010 I. Lehmann (deposited in TMSA).

Etymology: The species is named for my grandparents Willi Eduard Haberland, who passed away on 10th June 1982, as well as for his wife Charlotte Marie-Johanna. Both accompanied me during my childhood on very many field trips to record butterflies and moths in the Niederlausitz (northeastern Germany) during 1971-1982.

Description of the male (holotype)

Forewing length 11.0 mm; antenna-wing ratio 0.55:1.

Head: rough-scaled, mixed with long hairs of pale smoke grey, sepia and cartridge buff (from base to tip) around eyes as well as base of antennae, eyes black; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the upper half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pale smoke grey; branches of antennae seven times width of the shaft, narrow, covered with short hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches strongly bent towards tip of antenna, do touch each other; distance between branches at base two times width of branch; labial palpi long, narrow, as long as diameter of eye and densely covered with light brownish olive scales mixed with hairs of cartridge buff. **Thorax**: patagia and tegulae glossy, densely covered with long scales of pale smoke grey, mixed with scales of olivaceous black and cartridge buff; a small crest of pale smoke grey and olivaceous black on metathorax. **Abdomen**: largely cartridge buff, mixed with hairs of light brownish olive. **Legs**: femora, tibiae and tarsi covered with long, glossy hairs of ivory yellow; hindlegs with two pairs of short spurs, 0.8 mm, overlapping first tarsal joint. **Forewing**: upperside rough-scaled, pale smoke grey with small striae as well as patches of light greyish olive and olivaveous black; along the costal margin spots of olivaceous black; termen light greyish olive; below lower median and CuA_2 three rounded spots of pinkish buff; cilia glossy, long, 1.2 mm, ivory yellow at base, tips alternating pure white and light greyish olive. Underside rough-scaled, light greyish olive, glossy. **Venation**: cell slightly longer than half length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, slightly protruding upper angle; R_5+R_4+R_3 from top of areole, long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside light greyish olive, glossy; cilia long, 1.2 mm, ivory yellow at base, pure white at tips. Underside like in forewing; frenulum absent. **Venation**: cell shorter than the half length of the wing; 3A present, 1A+2A present, CuP rudimentary; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle that is open towards termen; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle

shorter than upper angle, veinlet in cell present. **Genitalia**: saccus rudimentary; tegumen and vinculum fused, forming a firm ring which is broad on its entire length; in between the upper half of tegumen a broad plate-like structure; valvae broad at base, two lobes present, narrow, upper lobe long with tiny setae at the rounded tip; lower lobe slightly broader than upper lobe, setae along its dorsal edge; a valval apodeme present above the juxta; sacculus small, narrow; uncus elongated, narrow (lateral view), bifid, tips acuminate with setae that extend towards an appendage at the base of uncus; in between the tips of the uncus a deep emargination; juxta broad, heart-shaped. Aedeagus simple, tube-like, narrow, long, almost as long as upper lobe, rounded basally, resembling a swallow tail distally; vesica without cornuti.

Diagnosis: *A. haberlandorum* spec. nov. is related to *A. iridescens* due to similarities in the antenna-wing ratio, in the venation of fore- and hindwings as well as in the genitalia. A second related species is *A. franziskae* spec. nov. Noteworthy is a broad plate-like structure in between the upper half of the tegumen in both species; a similar shaped uncus that is shorter and broader with a less deep emargination in *A. franziskae* spec. nov. as well as the similar shaped lobes. Differences exist in the antenna-wing ratio that is 0.72:1 in *A. franziskae* spec. nov., that is one of the highest ratios among the Metarbelidae. In the hindwing, M_1 and Rs are long stalked in *A. haberlandorum* spec. nov., but emerging from nearly the same point from the upper angle in the former species.

Habitat: The Cederberg (this spelling was approved on 03rd April 1981, instead of Cedarberg) is a mountain range *ca.* 90 km long and *ca.* 25 km wide, located in the Western Cape Province, roughly east of the towns Clanwilliam and Citrusdal. The area belongs to the *"Cape Floristic Region"* (*cf.* Taylor, 1978; Kruger, 1979) and lies close to its northwestern boundary, as well as to the *"Cape regional centre of endemism" sensu* White (1983). The Cape Floristic Region is one of 34 hotspots of biodiversity that exist worldwide, and is one of the five Mediterranean-type systems among the hotspots list. It has about 9000 plant species of which 6210 are endemic (Cowling & Pierce, 2004). Although ecological convergences exist – *e.g.*, its warm-temperate climate, the importance of fires, the dominance of evergreen sclerophyllous shrublands – to the four Mediterranean-type hotspots, in particular to southwestern Australia and to the Mediterranean Basin, the differences are stronger than the similarities (*e.g.*, Goldblatt, 1978; Cowling *et al.*, 2005). Since the Cederberg lies close to the northern limit of the Cape Fold Belt, it borders the Succulent Karoo in the north and partly in the east. Hence, it is a meeting place for Succulent Karoo species, but also for eastern forest as well as thicket species, *e.g.*, from the Drakensberg. The mountains of the Cederberg rise steeply from the Olifants River Valley in the west. For example, the highest peak Sneeuberg (2027 m) is only 17 km from Citrusdal (altitude: 170 m). About 80 % of the rain falls in the three winter months. Above 1000 m, like in Middelberg (altitude: 1222 m), the average annual rainfall is 939 mm, but at the Algeria Forest Station (altitude: 517 m), it is 647 mm (type locality). The prevalent vegetation of the Cape Region is fynbos. It characteristically occurs in the form of 1-3 m tall sclerophyllous or ericoid shrublands. Temperate forest types occur and are related to the Afromontane forest. For example, Starrenberg reported of large forests that occurred on the Cederberg in the year 1705; Alexander mentioned in 1836 that steep river banks *"... have many mimosas and willows ..."* (Skead, 1980). *Widdringtonia cedarbergensis* Marsh is one of those species that covered once large areas, mainly in the type of woodlands, but due to ruthless exploitation, heavy grazing, and frequent extensive wildfires, most of the stands do not longer exist or are degraded. Secondary vegetation is common today, *e.g.*, shrubland dominated by the "rhenosterbos" (*Elytropappus rhinocerotis* (L.f.) Less). Taylor (1996) treated the Cederberg as an important local centre of radiation due to the fact, that the Cederberg plant genera, on average, contain more species than their southwestern counterparts. The dominant landscape of the Cederberg are long, linear plateaus which are covered by *"Northern Inland Shale Band Vegetation" sensu* Rebelo *et al.* (2006) at altitudes of 400-1650 m. At lower limits of 500-1300 m occurs *"Ceres Shale Renosterveld" sensu* Rebelo *et al.* (2006) and at altitudes of 180-700 m, as at the Olifants River valley, *"Citrusdal Vygieveld" sensu* Mucina *et al.* (2006).

The astonishing number of five new *Arbelodes* species, which are probably all endemic to the Cape Floristic Region or perhaps to the Cederberg, supports the view of Taylor (1996), that the area is a local centre of species radiation. The Cederberg seems to be also an area with stable ecological and climatic conditions, perhaps for millions of years, based on its high number of endemic Metarbelidae, similarly to other ancient mountain ranges or coastal areas in Tanzania and Kenya (*cf.* Lehmann & Kioko, 2005; Lehmann 2008a, b; Lehmann 2010). The Rondegat – where all the five species have been recorded – has its source in the Cederberg and flows in a north-westerly direction for *ca.* 25 km to join the Olifants River at

Clanwilliam Dam. The catchment is 111 km^2 in area and receives an average annual rainfall of 700 mm. In its upper reaches, the river flows through often pristine fynbos, then through a catchment with pine and citrus plantations, cattle pasture, areas of dense infestation by alien trees and a forestry village (Lowe *et al.*, 2008). The collecting site was located among a relatively dense, narrow, indigenous woody riverine vegetation with tall trees (W. Mey pers. comm.). This site was most probably located at an altitude below 550 m. Woody species comprise the indigenous in-stream tree *Salix mucronata* Thunb. as well as tall trees of *Podocarpus elongatus* (Aiton) L'Hér. and the shrub *Clutia pulchella* L. River kloof thickets below 550 m were described in detail by Taylor (1996) for rivers – as the Rondegat – draining westwards into the Olifants River. Dominants comprise endemic tree species of the Capensis as *Brabejum stellatifolium* L. and the paleoendemic *Metrosideros angustifolia* (L.) Sm. as well as the shrub *Prionium serratum* (L.f.) Drége. Non-dominants include also endemic trees of the Capensis as *Brachylaena neriifolia* (L.) R. Br., the restioid *Calopsis paniculata* (Rottb.) Desv. and *Rhus angustifolia* L. The latter is particularly common in thickets of the southern Cederberg. Noteworthy are Succulent Karoo elements like *Euphorbia mauritanica* L. and *Rhus undulata* Jacq. that penetrate southward from Clanwilliam into the valleys of the Olifants, Rondegat and Jan Dissels River.

Ecology: *A. haberlandorum* spec. nov. is classified as a submontane and montane species. It is associated with woody riparian habitats that include Southern Afrotemperate Forest elements related to the Afromontane Region, Cape thicket elements and Succulent Karoo elements.

Distribution: *A. haberlandorum* spec. nov. is known only from the Cederberg. It is preliminarily classified as an endemic species of the Cape Floristic Region and as a potential endemic to the Cederberg.

***Arbelodes shimonii* spec. nov.**

Plate 4, figure 17; figures 17 a, b

Material examined: holotype male, S.A., Western Cape Province, Cederberg, Algeria, Farm Jamaka, Rondegat River, 21.March.2005, W. Mey leg., ex ZMHB, genitalia slide number 09/012010 I. Lehmann (deposited in the ZMHB).

Etymology: The species is named for my son Shimoni Lehmann who accompanied me on three journeys (2003-2006) to the coastal forests of Kenya.

Description of the male (holotype)

Forewing length 12.0 mm; antenna-wing ratio 0.58:1.

Head: rough-scaled, glossy, tilleul-buff mixed with long hairs of brownish olive around eyes as well as base of antennae, eyes wood brown with large black patches; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pearl grey; branches of antennae eight times width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches strongly bent towards tip of antenna, but do not touch each other; distance between branches at base 1.5 times width of branch; labial palpi long, narrow, as long as diameter of eye and densely covered with brownish olive scales mixed with long hairs of the same colour. **Thorax**: patagia pearl grey with a brownish olive collar ring; tegulae glossy, densely covered with long scales of pearl grey; two small crests of pearl grey with brownish olive tips on metathorax. **Abdomen**: tilleul buff mixed with hairs that have dawn grey tips. **Legs**: femora and tibiae with tilleul buff scales as well as long, glossy hairs; tarsi covered with glossy scales of tilleul buff; hindlegs with two pairs of long, narrow spurs, 1.1 mm, overlapping first tarsal joint. **Forewing**: upperside rough-scaled, very glossy, smoke grey; along the costal margin spots of deep olive-grey; a broad, pure white terminal band, edged tilleul buff and brownish olive; cell at base brownish olive, pure white and antimony yellow at centre, edged brownish olive; below lower median and CuA_2 largely pure white with several patches of Isabella colour edged brownish olive; cilia glossy, long, 1.1 mm long, tilleul buff at base, alternating pure white and pale olive-grey at tips. Underside rough-scaled, greyish olive, glossy. **Venation**: cell slightly shorter than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5 from top of the areole but its base is separated from R_4+R_3, which are long stalked and also emerge from the areole; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled

inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside faded, greyish olive, glossy, small white patches along termen; cilia long, 1.2 mm, as in forewing. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP present; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to $Sc+R_1$ which crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus absent; tegumen and vinculum fused, forming a firm ring that is very broad on its entire length; in between the upper half of tegumen no plate-like structure; valvae broad, two lobes present, narrow; upper lobe long with tiny setae on the ventral side and at the rounded tip; lower lobe thorn-like, without setae; valval apodeme absent; sacculus small, narrow; uncus short, broad (ventral view), no hole at its base on the dorsal surface, bifid, tips acuminate with setae extending towards base of uncus, in between the tips a deep and rounded emargination; juxta elongated with a deep emargination. Aedeagus simple, tube-like, broad, horn-like in shape, rounded basally, resembling a small swallow-tail distally; vesica without cornuti.

Diagnosis: *A. shimonii* spec. nov. is closest related to *A. dicksoni* spec. nov. (see below) based on a similar wing pattern, an almost identical venation of fore- and hindwing as well as a similar male genitalia. Nevertheless, the genitalia of *A. dicksoni* spec. nov. is different in the following four characters: Firstly, the uncus is longer, less broad and its emargination is not deep; secondly, the tegumen and vinculum are fused, forming a firm ring that is less broad on its entire length; thirdly, the upper lobe is strongly bent towards the uncus; fourthly, the aedeagus is not horn-like in shape. The antenna-wing ratio of 0.58:1 in *A. shimonii* spec. nov. is well below the ratio of other new species that occur sympatric on the Cederberg, as *A. kruegeri* spec. nov. and *A. franziskae* spec. nov. Noteworthy is, that *A. dicksoni* spec. nov. has an antenna-wing ratio of 0.50:1 which is currently the lowest among the *Arbelodes* in the Cape Floristic Region.

Habitat: *cf. A. haberlandorum* spec. nov.

Ecology: *A. shimonii* spec. nov. is classified as a submontane and montane species. It is associated with woody riparian habitats that include Southern Afrotemperate Forest elements related to the Afromontane Region, Cape thicket elements and Succulent Karoo elements.

Distribution: *A. shimonii* spec. nov. is known only from the Cederberg. It is preliminary classified as an endemic species of the Cape Floristic Region, where its closest related species occurs. It is a potential endemic of the Cederberg.

***Arbelodes dicksoni* spec. nov.**

Plate 4, figure 18; figures 18 a, b

Material examined: holotype male, S.A., Western Cape Province, Cape Town, 08..May.1937, C.G.C. Dickson leg., ex TMSA, genitalia slide number 30/082008 I. Lehmann (deposited in the TMSA).

Etymology: The species is named for Charles Gordon Campbell Dickson who collected the holotype and died in his home Blencathra, St. Michael's Estate, on 30th August 1991 aged 83. Charles Dickson lived in Cape Town his entire life. He became the leading authority on the butterflies of the Western Cape, was awarded an honorary Masters degree (entomology) by the University of Cape Town, although he was an engineer by education, and he set up a bursary/scholarship trust fund at the university.

Description of the male (holotype)

Forewing length 10.0 mm; antenna-wing ratio 0.50:1.

Head: rough-scaled, glossy, ivory yellow around eyes as well as base of antennae, eyes wood brown with black spots; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occur behind the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pure white; branches of antennae eight times width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches strongly bent towards tip of antenna, do not touch each other; distance between branches at base 1.5 times width of branch; labial palpi long, narrow, as long as diameter of eye and densely covered with ivory yellow scales mixed with long hairs of the same colour. **Thorax**: patagia and tegulae glossy, densely covered with long, pure white hairs mixed with ivory yellow; two small crests of ivory yellow on metathorax. **Abdomen**: largely pure white, mixed with hairs of ivory yellow, abdominal

tuft ivory yellow. **Legs**: femora and tibiae with long, glossy, pure white hairs, mixed with ivory yellow; tarsi covered with glossy scales of ivory yellow; hindlegs with two pairs of narrow spurs, 0.7 mm long, overlapping first tarsal joint. **Forewing**: upperside rough-scaled, glossy, ivory yellow; costal margin with spots of ivory yellow; a broad, pure white terminal band, edged ivory yellow; cell ivory yellow, but pure white at centre; below base of lower median a large patch of ivory yellow extending to inner margin; below CuA_2 largely pure white with one small patch of ivory yellow; cilia glossy, long, 1.2 mm, alternating pure white and ivory yellow. Underside rough-scaled, ivory yellow, glossy, costa warm buff. **Venation**: cell slightly longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5 from near top of areole; R_4+R_3 from top of areole, long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside ivory yellow, glossy; cilia long, 1.4 mm, coloured as in forewing. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP not seen; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus absent; tegumen and vinculum fused, forming a firm ring that is broad on its entire length; in between the upper half of the tegumen no plate-like structure; valvae broad at base, two lobes present, narrow, upper lobe long, strongly bent towards uncus with few tiny setae on the ventral side and at the rounded tip; lower lobe thorn-like with setae on the dorsal side; valval apodeme absent; sacculus small, narrow; uncus long, broad (ventral view), no hole at its base dorsally, bifid, tips acuminate with setae extending towards base of uncus, in between the tips a small and rounded emargination; juxta elongated with a deep emargination. Aedeagus simple, tube-like, broader and rounded basally, bud-like distally; vesica without cornuti.

Diagnosis: *A. dicksoni* spec. nov. is closest related to *A. shimonii* spec. nov., but is smaller in size and has shorter, less elongated forewings that have at the base of the wing a large ivory yellow patch from below lower median to the dorsum.

Habitat: Cape Town (altitude 6-12 m; average annual rainfall 517 mm) is located in the Western Cape Province, bordering the Atlantic Ocean in the west. The area belongs to the *"Cape Floristic Region"* (Taylor, 1978; Kruger, 1979) as well as to the *"Cape regional centre of endemism" sensu* White (1983). A common vegetation type of the Cape Town metropolitan area, and near the University of Cape Town, is *„Peninsula Sandstone Fynbos" sensu* Rebelo *et al.* (2006) at an altitude of 20-1086 m. The vegetation is a medium dense, tall proteoid shrubland over a dense moderately tall, ericoid-leaved shrubland. The number of endemic plant species is very high, including the small tree *Mimetes fimbriifolius* Salisb. Examples of small trees or tall shrubs comprise *Leucospermum conocarpodendron* ssp. *viridum* Rourke, *Protea lepidocarpodendron* (L.) L., *Metalasia densa* (Lam.) P.O. Karis and *Erica tristis* Bartl. „St. Michael's Estate" is an older term for a suburb of Cape Town, now called Tamboers Kloof, located less than 2 km southeast from Signal Hill (altitude 350 m), Cape Town metropolitan area, north from Table Mountain (altitude 1086 m). The former house of Charles Dickson is just below Signal Hill. Both areas are covered by *„Peninsula Shale Renosterveld" sensu* Rebelo *et al.* (2006) at an altitude of 0-350 m. This is an open shrubland and grassland with frequent fires every 3-5 years. It includes Cape thicket species, *e.g.*, the tall shrub *Gymnosporia buxifolia* (L.) Szyszyl. On Signal Hill, characteristic species are low shrubs as *Elytropappus rhinocerotis* (L.f.) Less. (an indicator of secondary vegetation), *Lobostemon fruticosus* (L.) H. Buek. and *Cliffortia polygonifolia* L.

Ecology: *A. dicksoni* spec. nov. is classified as a lowland and submontane species. Its habitat is associated with Cape thickets and frequent fires. Hence, *A. dicksoni* spec. nov. must be fire-tolerant. It appears to be adapted to southern African subtropical thicket vegetation for which drought, fires and gap-producing tree/shrub mortality are umimportant for defoliation.

Distribution: *A. dicksoni* spec. nov. is known only from Cape Town. It is preliminarily classified as an endemic species of the Cape Floristic Region. It might be rare since only one specimen is known from an area which was well studied by Charles Dickson for many years.

***Arbelodes varii* spec. nov.**

Plate 4, figure 19; figures 19 a, b

Material examined: holotype male, S.A., Western Cape Province, Bloubergstrand, 15.February.1977, L. & G. Vári leg., ex TMSA, genitalia slide number 31/082008 I. Lehmann (deposited in the TMSA).

Etymology: The species is named for Lajos Vári who collected the holotype together with his wife Geer. Lajos Vári was born in Budapest, Hungary 1916, and was adopted by foster parents in Holland as a young child due to the tragic circumstances relating to World War 1. He achieved a doctorate, and worked many years as curator and later Head of the Lepidoptera Department at the Transvaal Museum, Pretoria, until his retirement in 1976.

Description of the male (holotype)

Forewing length 10.0 mm; antenna-wing ratio 0.60:1.

Head: rough-scaled, glossy, olive hairs around eyes as well as base of antennae, eyes black; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales olive; branches of antennae seven times width of shaft, narrow, hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two or three finger-like scales, branches strongly bent towards tip of antenna, but do not touch each other; distance between branches at base narrow, about width of branch; labial palpi long, narrow, longer than diameter of eye and densely covered with olive scales. **Thorax**: patagia and tegulae glossy, densely covered with long, warm buff hairs mixed with sepia at their tips; the sepia colour forms a collar ring; two small crests of warm buff on metathorax. **Abdomen**: largely warm buff, abdominal tuft sepia and warm buff. **Legs**: only forelegs present; femora and tibiae with long, glossy, warm buff hairs, mixed with sepia, tarsi covered with glossy scales of warm buff. **Forewing**: upperside rough-scaled, light yellowish olive; along the costal margin spots of sepia; three small pure white spots at apex; a broad terminal band of light yellowish olive mixed with olive-ocher, edged sepia; cell with an oval shaped spot of olive-ocher, edged sepia; below base of lower median two large pure white patches; below CuA_2 two smaller pure white patches; cilia glossy, long, 1.0 mm, light yellowish olive. Underside rough-scaled, light yellowish olive. **Venation**: cell slightly longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; a strong fold above base of M_2; M_1 from upper angle; areole elongated, protruding upper angle; R_5 from near top of areole; R_4+R_3 from top of areole, long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside glossy, sepia, several veins light yellowish olive; cilia long, 1.0 mm, light yellowish olive. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP not seen; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs on a long stalk and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell obsolete towards base. **Genitalia**: saccus absent; tegumen and vinculum fused, forming a firm ring which is broad on its entire length; in between the upper half of the tegumen no plate-like structure; valvae broad at base, two lobes present, narrow; upper lobe long, bent towards uncus, long setae on the ventral side and at the rounded tip; lower lobe thorn-like, with long setae mainly on the ventral side; valval apodeme absent; sacculus small, narrow; uncus long, broad (ventral view), no hole at its base dorsally, bifid, tips acuminate with setae extending towards below base of uncus, in between the tips a small and rounded emargination; juxta broad without an emargination. Aedeagus simple, tube-like, broader and rounded basally; vesica without cornuti.

Diagnosis: *A. varii* spec. nov. is related to *A. dicksoni* spec. nov. based on the similar venation (M_1 and Rs on a long stalk; R_5 from near top of areole; R_4+R_3 from top of areole, long stalked). An outstanding difference between both species is the antenna-wing ratio of 0.60:1 in the former and 0.50:1 in the latter, respectively. An antenna-wing ratio of equal to or greater than 0.60:1 has been found in one forest species from the Eastern Cape Province (*A. flavicolor*), in several species from the Cederberg (Western Cape Province) and in several species extending from the Cape Floristic Region via western Namibia to Windhoek in the north. The male genitalia of *A. varii* spec. nov. has a narrow tegumen and its two lobes have more setae than in *A. dicksoni* spec. nov.

Habitat: Bloubergstrand (altitude 5-25 m; average annual rainfall 375 mm) is located close to the Atlantic Ocean in the Western Cape Province and *ca.* 16 km north from Cape Town. The town is named after the Blouberg (altitude 331 m; average annual rainfall 488 mm) which is a hill just inland from the coastline. The area belongs to the *"Cape Floristic Region"* (Taylor 1978; Kruger, 1979) as well as to the *"Cape regional centre of endemism" sensu* White (1983). Around Bloubergstrand occurs *„Cape Seashore Vegetation" sensu* Mucina *et al.* (2006) on beaches, coastal dunes and coastal cliffs. It is an open grassy, herbaceous, dwarf-shrubby and sometimes succulent vegetation type. Shrubs include, *e.g.*, *Lycium tetrandrum* Thunb., *Scaevola plumieri* (L.) Vahl and several succulent shrub species of the genus *Drosanthemum*. Further inland, and towards the Blouberg, the area is covered by *„Cape Flats Sand Fynbos" sensu* Rebelo *et al.* (2006). This is a dense, moderately tall, ericoid shrubland with scattered tall shrubs. It is a type of fynbos that is richer than the other West Coast sand fynbos types, above all in woody shrubs and Proteaceae. Characteristic species of Cape thickets comprise the tall shrubs *Pterocelastrus tricuspidatus* (Lam.) Walp. and *Rhus lucida* L. Other important species are, for example, *Protea burchellii* Stapf and *P. repens* (L.) L. It is noteworthy, that more than 80 % of the original area of *„Cape Flats Sand Fynbos"* has been transformed or mismanaged.

Ecology: *A. varii* spec. nov. is classified as a lowland species. Its habitat is associated with Cape thickets and dwarf-shrubby seashore vegetation. It is currently one of the few *Arbelodes* species that occurs along a portion of the West Coast which is under the influence of cold seawater from the Benguela Current, and hence, characterized by a low as well as seasonal rainfall (winter-rainfall peak).

Distribution: *A. varii* spec. nov. is known only from Bloubergstrand. It is classified as a potential endemic species of the Cape Floristic Region.

***Arbelodes franziskae* spec. nov.**

Plate 4, figure 20; figures 20 a, b

Material examined: holotype male, S.A., Western Cape Province, Cederberg, Algeria, Farm Jamaka, Rondegat River, 16.April.2006, K. Gainsford leg., ex ZMHB, genitalia slide number 31/012010 I. Lehmann (deposited in the ZMHB).

Etymology: The species is named for Franziska Dorothea Sommerlatte (Cape Town), who was born in Nairobi, and who often accompanied me during her childhood to discover the beauty of the flora and Lepidoptera of the Athi River Kapiti Plains (Kenya) in 1989-2000.

Description of the male (holotype)

Forewing length 9.0 mm; antenna-wing ratio 0.72:1.

Head: rough-scaled, smoke grey mixed with long hairs of greyish olive around eyes as well as base of antennae, eyes wood brown with black patches; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pale smoke grey; branches of antennae eight times width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two or three thorn-like scales, branches strongly bent towards tip of antenna, and hence, the branches touch each other towards tip; distance between branches at base wide, about two times width of branch; labial palpi long, narrow, as long as diameter of eye and densely covered with smoke grey scales. **Thorax**: patagia densely covered with long, smoke grey hairs that are mixed with sepia and pallid mouse grey, a collar ring of sepia; tegulae mainly pallid mouse grey mixed with sepia; two small crests of smoke grey mixed with sepia on metathorax. **Abdomen**: pale olive-buff, abdominal tuft present. **Legs**: femora with long, dense hairs of greyish olive with pure white tips, mixed with black hairs; tibiae and tarsi with greyish olive scales mixed with black; hindlegs with two pairs of spurs, narrow, long, 1.2 mm, lower pair 1.1 mm, overlapping first tarsal joint. **Forewing**: upperside faded, rough-scaled, glossy, smoke grey; an oblique streak of sepia from apex to half of CuA_1, probably edged pinkish buff towards termen; below lower median one large pure white patch, edged sepia; below CuA_2 a smaller pure white patch edged sepia; pinkish buff towards the dorsum; cilia glossy, long, 1.0 mm, at base pale olive buff, tips sepia mixed with smoke grey. Underside rough-scaled, light greyish olive, glossy. **Venation**: cell longer than half the length of the wing; 1A+2A long forked at base, CuP obsolete; CuA_2 from one third of lower median,

CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5+R_4+R_3 from the same point at top of areole, R_4+R_3 long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled slightly inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell rather obsolete. **Hindwing**: upperside greyish olive, glossy; cilia as in forewing. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP present; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs not from the same point, slightly separated at base and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle shorter than upper angle, veinlet in cell present. **Genitalia**: saccus small, rounded at tip; tegumen and vinculum fused, forming a firm ring, tegumen narrow, vinculum broader towards the ventral side; in between the upper half of tegumen a thin plate-like structure (best visible immediately after dissection); valvae broad at base, two lobes present, narrow; upper lobe long, bent towards uncus with setae on the whole ventral side and at the rounded tip; lower lobe thorn-like with setae mainly on the ventral side; a gap, almost triangular, in between the ventral side of valvae and vinculum; below the vinculum a hook-like structure (viewed laterally); valval apodeme absent; sacculus small, narrow; uncus elongated, no hole at its base dorsally, bifid, a rounded deep emargination, tips acuminate with setae extending towards below base of uncus; juxta broad, heart-shaped. Aedeagus simple, funnel-like, broader and rounded basally, resembling a swallow-tail distally; vesica without cornuti.

Diagnosis: *A. franziskae* spec. nov. is related to *A. varii* spec. nov. because of a similar male genitalia. The narrow tegumen and the two lobes which are covered with many setae are two common characters. An outstanding difference is the antenna-wing ratio of 0.72:1 in *A. franziskae* spec. nov. that is currently the highest among *Arbelodes*. Similar antenna-wing ratios have been found in two other species from the same locality, namely in *A. agassizi* spec. nov. (0.65:1) and *A. kruegeri* spec. nov. (0.69:1) as well as in *A. dupreezi* spec. nov. (0.64:1) and *A. heringi* (Janse) (0.70:1) from western Namibia. Remarkable characters of *A. franziskae* spec. nov. include a long fork of 1A+2A; the slightly separated M_1 and Rs in the hindwing (stalked in all other *Arbelodes*) and the hook-like structure (with a rounded tip when viewed ventrally) below the vinculum. The latter character occurs in *A. deprinsi* spec. nov. and *A. albitorquata* (Hampson). However, both species are not related to *A. franziskae* spec. nov. since they have, for example, a very broad tegumen and vinculum.

Habitat: *cf. A. haberlandorum* spec. nov.

Ecology: *A. franziskae* spec. nov. is classified as a submontane and montane species. It is associated with woody riparian habitats that include Southern Afrotemperate Forest elements related to the Afromontane Region, Cape thicket elements and Succulent Karoo elements.

Distribution: *A. franziskae* spec. nov. is known only from the Cederberg. It is preliminarily classified as an endemic species of the Cape Floristic Region, where its closest related species occurs north from Cape Town. It is a potential endemic of the Cederberg.

***Arbelodes agassizi* spec. nov.**

Plate 4, figure 21; figures 21 a, b

Material examined: holotype male, S.A., Western Cape Province, Cederberg, Algeria, Farm Jamaka, Rondegat River, 21.March.2005, W. Mey leg., ex ZMHB, genitalia slide number 15/012010 I. Lehmann (deposited in the ZMHB).

Etymology: The species is named in honour of Dr David Agassiz (Weston-super-Mare, UK) who worked as a parish priest (Anglican church) until 1990 in Essex. Interestingly, he later completed his PhD in ecology and worked as a Training Officer and Lepidopterist at the International Institute of Entomology until 1996 when he became a Scientific Associate at The Natural History Museum (London) and still explores the Lepidoptera diversity on the genus *Acacia* in the Rift Valley, Kenya, where he lived and worked during 1998-2000. At the moment he is the General Secretary of the Societas Europaea Lepidopterologica e.V. (SEL).

Description of the male (holotype)

Forewing length 10.0 mm; antenna-wing ratio 0.65:1.

Head: small, a peculiar elongated shape in between eyes and base of antennae; rough-scaled, glossy, pale smoke grey mixed with long hairs of pure white and black around eyes as well as base of antennae, eyes black; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales pale smoke grey; branches of antennae seven times width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches strongly bent towards tip of antenna and touch each other; distance between branches (at base) 1.5 times width of branch; labial palpi long, narrow, as long as diameter of eye, densely covered with buffy brown scales, mixed with black hairs. **Thorax**: patagia glossy, densely covered with long scales which are black at centre but pure white at tip and pale smoke grey towards base, forming a collar ring; tegulae as patagia with two small crests on metathorax. **Abdomen**: smoke grey mixed with hairs of ivory yellow including the abdominal tuft. **Legs**: femora and tibiae covered with long, pale smoke grey hairs, glossy; tarsi densely scaled, pale smoke grey mixed with black; hindlegs with two pairs of spurs, narrow, long, 1.2 mm, lower pair 1.0 mm, overlapping first tarsal joint. **Forewing**: upperside rough-scaled, glossy, light greyish olive; along the costa deep greyish olive spots; terminal band light greyish olive, edged pure white towards base of wing; lunules along the termen light greyish olive edged pure white; subterminal band oblique from near apex to near tornus, broad, greyish olive, edged on both sides with deep greyish olive patches; below lower median and near base of wing two pure white patches, edged sepia; below CuA_2 two pure white spots edged sepia as well as light greyish olive; cilia glossy, long, 1.0 mm, at base greyish olive, tips light greyish olive. Underside on the whole wing rough-scaled, smoke grey mixed with deep greyish olive, glossy. **Venation**: cell longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5 from near top of areole; R_4+R_3 from top of areole and long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside buffy olive, glossy; cilia as in forewing. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP present; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs from the same point, slightly stalked and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle shorter than upper angle, veinlet in cell present. **Genitalia**: saccus very small, rounded at tip; tegumen and vinculum fused, forming a firm ring that is broad on its entire length; in between the upper half of the tegumen a thin plate-like structure (best visible immediately after dissection); valvae broad at base, two lobes present; upper lobe broad, long, bent towards uncus, setae on the whole ventral side and at the rounded tip; lower lobe thorn-like with setae mainly on the ventral side; a large triangular gap in between the ventral side of valvae and vinculum; below the vinculum no hook-like structure; valval apodeme absent; sacculus small, narrow; uncus elongated, no hole at its base dorsally, bifid, tips acuminate with setae extending towards below base of uncus, in between the tips a rounded, very deep emargination (half the length of uncus); juxta rather narrow, heart-shaped. Aedeagus simple, funnel-like, broader and rounded basally, resembling a swallow-tail distally; vesica without cornuti.

Diagnosis: *A. agassizi* spec. nov. is closely related to *A. kruegeri* spec. nov. due to: Firstly, a similar antenna-wing ratio of 0.65:1 in the former and 0.69:1 in the latter species; secondly, an almost identical wing venation (the only difference is that M_1 and Rs are long stalked in *A. kruegeri* spec. nov. but not in *A. agassizi* spec. nov.) and thirdly, a similar male genitalia. Nevertheless, both species were separated here because of the following characters in *A. kruegeri* spec. nov.: Firstly, it is a much larger species and has a different pattern on the forewing. Secondly, the saccus is much longer and larger. The large triangular gap (only visible when viewed laterally) between the ventral side of the shorter lobe and the vinculum as well as the very deep emargination in the uncus are characteristics of *A. agassizi* spec. nov. The large rounded structure (a kind of valval apodeme ?) above the juxta with many short setae on the dorsal surface is entirely absent in *A. agassizi* spec. nov. Noteworthy is, that the small head with a peculiar elongated shape in between eyes and base of antennae has also been observed in *A. flavicolor* (Janse).

Habitat: *cf. A. haberlandorum* spec. nov.

Ecology: *A. agassizi* spec. nov. is classified as a submontane and montane species. It is associated with woody riparian habitats that include Southern Afrotemperate Forest elements related to the Afromontane Region, Cape thicket elements and Succulent Karoo elements.

Distribution: *A. agassizi* spec. nov. is known only from the Cederberg. It is preliminarily classified as an endemic species of the Cape Floristic Region, where its closest related species occurs sympatric along the Rondegat River. It is a potential endemic of the Cederberg.

***Arbelodes kruegeri* spec. nov.**

Plate 4, figure 22; figures 22 a, b

Material examined: holotype male, S.A., Western Cape Province, Cederberg, Algeria, Farm Jamaka, Rondegat River, 21.March.2005, W. Mey leg., ex ZMHB, genitalia slide number 02/112009 I. Lehmann (deposited in the ZMHB).

Etymology: The species is named in honour of Dr Martin Krüger, a professional lepidopterist, who is the Head of the Department of Invertebrates (Lepidoptera) and currently the acting Director of the Transvaal Museum of Natural History (TMSA, Pretoria). I am very grateful to him for giving me the opportunity to study unique type specimens and other Metarbelidae from the collection of the TMSA.

Description of the male (holotype)

Forewing length 13.0 mm; antenna-wing ratio 0.69:1.

Head: rough-scaled, glossy, largely with scales of deep greyish olive mixed with long hairs of buffy brown and black around eyes as well as base of antennae, eyes vinaceous with black patches; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, scales deep greyish olive; branches of antennae eight times the width of shaft, narrow, covered with hairs in pairs projecting inwards from tip to base, tip of branch acuminate with one or two thorn-like scales, branches strongly bent towards tip of antenna, touch each other; distance between branches (at base) 1.5 times the width of branch; labial palpi short, narrow, less than diameter of eye and densely covered with buffy brown scales, mixed with black hairs. **Thorax**: patagia glossy, densely covered with long scales which are deep greyish olive and black, some are pure white at tip, forming a collar ring; tegulae glossy, deep greyish olive; two small crests on metathorax. **Abdomen**: ecru-olive mixed with hairs of ivory yellow including the abdominal tuft. **Legs**: femora and tibiae covered with long hairs, deep greyish olive, mixed with pure white, glossy; tarsi densely scaled, deep greyish olive; hindlegs with two pairs of spurs, narrow, long, 1.2 mm, lower pair 1.0 mm, overlapping first tarsal joint. **Forewing**: upperside rough-scaled, glossy, light greyish olive; along the costa deep greyish olive spots; terminal and postmedial band from near apex to the dorsum, forming a narrow "0", pale smoke grey, a glint shine gives both bands a silvery appearance, edged sepia; lunules along the termen absent; subterminal band not glossy, oblique from near apex to near CuA_2, broad, light greyish olive, edged on both sides sepia; below lower median and near base of the wing two pure white patches, edged sepia; below base of CuA_2 a pure white spot edged sepia; upper and lower median smoke grey; cilia glossy, long, 1.3 mm, at base dark olive buff, tips smoke grey. Underside rough-scaled, ecru-olive, glossy. **Venation**: cell longer than half the length of the wing; 1A+2A long forked at base (fork almost one-third of the length of 1A+2A), CuP obsolete; CuA_2 from almost half of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5 from near top of areole; R_4+R_3 from top of areole and long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside greyish olive, glossy; cilia as in forewing. Underside as in forewing; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP present; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs long stalked and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle shorter than upper angle, veinlet in cell present. **Genitalia**: saccus moderately long, rounded at tip; tegumen and vinculum fused, forming a firm ring that is broad on its entire length; in between the upper half of tegumen a thin plate-like structure (best visible immediately after dissection); valvae broad at base, two lobes present; upper lobe broad, long, bent

towards uncus, with setae on the whole ventral side and at the rounded tip; lower lobe thorn-like, setae mainly on ventral side; a large triangular gap in between ventral side of valvae and vinculum absent; below the vinculum no hook-like structure; there is a large, rounded structure (a kind of valval apodeme ?) above the juxta, attached to the upper lobe and to the vinculum, the dorsal surface of this structure is covered with many short setae; sacculus small, narrow; uncus elongated with a small hole at its base dorsally, bifid, tips acuminate with setae extending towards base of uncus, in between the tips a rounded, small emargination; juxta broad, heart-shaped. Aedeagus simple, funnel-like, broader and rounded basally, narrow, resembling a swallow-tail distally; vesica without cornuti.

Diagnosis: *A. kruegeri* spec. nov. is closely related to *A. agassizi* spec. nov. Additionally to the differences mentioned above, it is noteworthy, that the strong glint shine with a silvery appearance, in particular on the terminal and postmedial band, is a very rare feature among the Metarbelidae. This rare feature is also known in *A. shimonii* spec. nov. that occurs sympatric with *A. kruegeri* spec. nov. as well as in two undescribed *Salagena* species from Durban (South Africa) and Mzuzu (Malawi).

Habitat: *cf. A. haberlandorum* spec. nov.

Ecology: *A. kruegeri* spec. nov. is classified as a submontane and montane species. It is associated with woody riparian habitats that include Southern Afrotemperate Forest elements related to the Afromontane Region, Cape thicket elements and Succulent Karoo elements.

Distribution: *A. kruegeri* spec. nov. is known only from the Cederberg. It is preliminarily classified as an endemic species of the Cape Floristic Region, where its closest related species occurs sympatric along the Rondegat River. It is a potential endemic of the Cederberg.

Arbelodes heringi (Janse, 1930)

Plate 5, figure 23 a, b; figures 23 a, b

Original combination: *Metarbela heringi* Janse, 1930

Synonyms: None

Note: Gaede (1929, plate XIV) figured a species which is named "albicostata" resembling *A. heringi* in the wing pattern. This name is not accompanied by a description, nor by a definition of the taxon, nor by an indication according to Article 12.2 of the International Code of Zoological Nomenclature (The International Trust for Zoological Nomenclature, 1999). Hence, this name will be treated herein as "unpublished" in regard to the Metarbelidae.

Material examined: holotype male, S.W. Africa, Windhoek, no date, V. Zobrys leg., ex ZMHB, genitalia slide number 26/092009 I. Lehmann (deposited in the ZMHB).

Male, same locality, no date, Knier leg., det. as *Aethiopina* Gaede by F. Daniel 1949, ex ZSM, genitalia slide number 07/052010 I. Lehmann (deposited in ZSM).

Description of the male (holotype)

Forewing length 10.0 mm; antenna-wing ratio 0.70:1.

Head: rough-scaled, glossy, ecru-olive mixed with long hairs of the same colour around eyes as well as base of antennae, eyes black; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, greyish olive; branches of antennae seven times the width of shaft, narrow, covered with hairs in pairs, projecting inwards from tip to base, tip of branch acuminate with two thorn-like scales, branches strongly bent towards tip of antenna, touch each other; distance between branches (at base) 1.5 times the width of branch; labial palpi long, narrow, as long as diameter of eye and densely covered with greyish olive scales. **Thorax**: patagia glossy, long and densely scaled, warm buff with hairs of sepia, forming a collar ring; tegulae glossy, warm buff mixed with sepia; two small crests of ivory yellow hairs mixed with sepia on metathorax. **Abdomen**: warm buff mixed with hairs of ivory yellow including the abdominal tuft. **Legs**: all legs are absent in the holotype. In the second male mentioned above, the legs can be described as follows: femora and tibiae covered with long, ivory yellow hairs mixed with warm buff, glossy; tarsi densely scaled ivory yellow with scattered hairs of warm buff; hindlegs with two pairs of spurs, very narrow, long, 1.1 mm, lower pair of equal length, overlapping first tarsal joint. **Forewing**: upperside rough-

scaled, glossy, ecru-olive; along the costa smoke grey with deep greyish olive spots; terminal band pure white, edged sepia towards base of wing; along the termen small lunules of sepia; subterminal band from near apex to the dorsum, ecru-olive, edged sepia; below lower median and near base of wing a narrow pure white band, edged sepia, which extands in an arc-like pattern to the base of CuA_2 and from here back to the base of the wing; one pure white patch at the end of CuA_2 extending to the dorsum; in between the white patches light buff; a pure white and small elongated patch in the cell; cilia glossy, long, 1.2 mm, alternating white and ecru-olive. Underside on the whole wing rough-scaled, ecru-olive, glossy. **Venation**: cell longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one-third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5 from near top of areole; R_4+R_3 from top of areole and long stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside ecru-olive, glossy; cilia as in forewing. Underside rough-scaled, ecru-olive; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A obsolete, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs stalked and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length; discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus absent; tegumen and vinculum fused, forming a firm ring that is broad on its entire length, vinculum broader; in between the upper half of tegumen a thin plate-like structure (best visible immediately after dissection); valvae broad at base, two lobes present; upper lobe broad, long, bent towards uncus, setae on the whole ventral side and at the rounded, elongated tip; lower lobe thorn-like with setae mainly on the ventral side; a gap in between the ventral side of valvae and vinculum absent; below the vinculum no hook-like structure; there is a large, rounded structure (a kind of valval apodeme ?) above the juxta, probably attached to the upper lobe and vinculum, the dorsal surface of this structure is covered with few tiny setae; sacculus small, narrow; uncus broad, triangular (viewed ventrally) elongated (viewed laterally), bifid, tips acuminate with long setae, emargination small, rounded; juxta broad, heart-shaped. Aedeagus simple, funnel-like, very broad and rounded basally, narrow and rounded distally; vesica without cornuti.

Diagnosis: *A. heringi* is related to species from the Cape Floristic Region and in particular to *A. kruegeri* spec. nov. If compared to the latter species the similar venation as well as the almost identical and high antenna-wing ratio of 0.69:1 in the latter species and 0.70:1 in *A. heringi* are noteworthy. The male genitalia is similar, too, comprising: Firstly, a short, funnel-like aedeagus; secondly, two lobes of which the upper one has a tip resembling a small finger-nail (best visible immediately after dissection); thirdly, a large, rounded structure (a kind of valval apodeme ?) above the juxta and fourthly, the small, rounded emargination in the uncus. The entirely different wing pattern, the hole at the base of the dorsal surface of the uncus in *A. kruegeri* spec. nov., that is absent in *A. heringi*, as well as the absence of a saccus in the latter species, justify that both are treated as two separate species.

Habitat: Windhoek (altitude 1721 m; mean annual rainfall 382 mm) is located in central Namibia on the Khomas Hochland plateau area and Windhoek Bergland. Both belong to the *„Highland Savanna" sensu* Giess (1971) and to the *„Kalahari-Highveld regional transition zone" sensu* White (1983). The flora is a mixture of Zambezian, Karoo-Namib and endemic species. The Auas Mountain complexes are located about 10 km southeastern from Windhoek. They are geologically linked to the Khomas Hochland and have been identified as an Important Plant Area (Hofmeyr, 2004). The Khomas Hochland is characterized by rolling plains interspersed by inselbergs and scattered rocky outcrops. The latter have their own unique vegetation types, for example, with *Aloe littoralis* Baker. The remaining areas are covered by an *Acacia hereroensis* Engl.-*Tarchonanthus camphoratus* L. association with *Albizia anthelmintica* (A. Rich.) Brongn., *Dombeya rotundifolia* (Hochst.) Planch. and *Maerua schinzii* Pax. The shrub layer is diverse with, *e.g., Acacia hebeclada* DC. ssp. *hebeclada*. The grass layer is often open. The foot slopes of the Khomas Hochland are stony and similar in regard to their vegetation types on upper slopes, but within the Windhoek Townlands the original foot slope vegetation has been largely degraded to mine gravel. Locally occur dense stands of *Acacia mellifera* (Vahl) Benth. ssp. *detinens* (Burch.) Brenan. This is a species that has increased through bush encroachment. Giess (1968) mentioned another example for areas south of Windhoek where he observed an increasing and very dense bush encroachment of *Lycium bosciifolium* Schinz and *Rhigozum trichotomum* Burch.

in 1952 on formerly cut grasslands (until 1915) which had only scattered trees of *Acacia giraffae* Willd., *Boscia albitrunca* (Burch.) Gilg & Benedict and *Ziziphus mucronata* Willd. along dry river beds. South of Windhoek occur *Acacia erioloba* E. Mey. woodlands associated with *Grewia flava* DC. and *Ziziphus mucronata* Willd. A high diversity and endemism are found among the geophytic genera *Scilla*, *Ledebouria*, *Nerine* and *Crinum*; *Pseudogaltonia clavata* (Mast.) E. Phillips is common in these woodlands. Southwestern from Windhoek occur grassy *„omurambas"*. These are shallow drainage lines, *e.g.*,. with *Gnidia polycephala* (C.A. Mey.) Gilg, *Asparagus laricinus* Burch., *Ziziphus mucronata* Willd., *Hermannia damarana* Baker f. and the rare endemic *Pegolettia pinnatilobata* (Klatt) O. Hoffm.

Ecology: *A. heringi* is classified as a montane species. Its habitat is associated with wooded grasslands that support locally a diverse shrub layer as well as a different, highly specific vegetation with a number of niche species that are restricted to rocky outcrops. The geophytic flora is very diverse and includes many endemic species.

Distribution: *A. heringi* is only known from Windhoek. It is preliminarily classified as an endemic species of the *„Kalahari-Highveld regional transition zone"* and as an endemic of Namibia. Since its closest related species occurs in the *„Cape Floristic Region"*, it is expected that its range extends in particular further south from Windhoek.

***Arbelodes dupreezi* spec. nov.**

Plate 5, figure 24; figures 24 a, b

Material examined: holotype male, Namibia, Karas Region, Farm Aar, 15.-17.January.1972, Southern Africa Expedition B.M. 1972-1, ex BMNH, genitalia slide number 18/022010 I. Lehmann (deposited in the BMNH, genitalia slide number BMNH COSS 419).

Etymology: The species is named for Peter du Preez (Drakensberg Boys Choir School, South Africa) who provided detailed information about the flora of the Dragon Peaks Mountain Resort.

Description of the male (holotype)

Forewing length 14.0 mm; antenna-wing ratio 0.64:1.

Head: rough-scaled, glossy, ivory yellow mixed with long hairs of dark olive-grey around eyes as well as base of antennae, eyes ecru-olive with black patches; a pair of small pits on lower part of frontoclypeus absent, but a pair of small pits occurs behind the lower half of the labial palpi; antennae bipectinate, scaled on shaft and dorsal side of branches, pale smoke grey; branches of antennae eight times the width of shaft, narrow, covered with hairs in pairs, projecting inwards from tip to near base, tip of branch acuminate with two thorn-like scales, branches strongly bent towards tip of antenna, touch each other; distance between branches (at base) one time the width of branch; labial palpi long, narrow, as long as diameter of eye and densely covered with scales of colonial buff. **Thorax**: patagia glossy, densely covered with long hairs of ivory yellow mixed with hairs of dark olive-grey, forming a collar ring; tegulae glossy, ivory yellow mixed with dark olive-grey; two small crests of buffy brown mixed with dark olive-grey on metathorax. **Abdomen**: largely ivory yellow. **Legs**: femora and tibiae covered with long, ivory yellow hairs mixed with dark olive-grey, glossy; tarsi densely scaled, ivory yellow; hindlegs with two pairs of spurs, narrow, long, 1.2 mm, overlapping first tarsal joint. **Forewing**: upperside faded, rough-scaled, glossy, dark olive-grey; along the costa buffy brown; a prominent patch of ivory yellow (that might be pure white in a fresh specimen), edged buffy brown at the end of cell; below lower median and near base of wing a large, triangular patch of buffy brown, edged sepia and ivory yellow (that might be pure white in a fresh specimen); CuA_2 pure white; cilia glossy, long, 1.1 mm, dark olive-grey, ivory yellow towards base. Underside rough-scaled, dark olive-grey, glossy. **Venation**: cell longer than half the length of the wing; 1A+2A forked at base, CuP obsolete; CuA_2 from one-third of lower median, CuA_1 from half the distance of CuA_2 to M_3; veins M_3 and M_2 separated and from lower angle; M_1 from upper angle; areole elongated, protruding upper angle; R_5+R_4+R_3 from top of areole and stalked; R_2 from areole; R_1 from upper angle; Sc more or less parallel to R_1; discocellular angled inwardly, upper angle open towards termen; lower angle slightly shorter than upper one, veinlet in cell obsolete towards base. **Hindwing**: upperside dark olive-grey, glossy; cilia as in forewing. Underside rough-scaled, dark olive-grey; frenulum absent. **Venation**: cell shorter than half the length of the wing; 3A present, 1A+2A present, CuP obsolete; CuA_2 as in forewing; CuA_1, M_3 and M_2 from lower angle, M_3 and M_2 separated; M_1 and Rs stalked and emerging from upper angle; no bar to Sc+R_1, the latter crosses the base of the upper median of the cell at one-third of its length;

discocellular angled inwardly, lower angle slightly shorter than upper angle, veinlet in cell present. **Genitalia**: saccus small and broad with three rounded tips (viewed ventrally); tegumen and vinculum fused, forming a firm ring that is broad on its entire length, vinculum broader; in between the upper half of the tegumen a thin plate-like structure (best visible immediately after dissection); valvae broad at base, two lobes present; upper lobe broad, long, stands upright towards uncus, short setae on the whole ventral side and at the rounded tip; lower lobe broad, thorn-like, setae mainly on the dorsal side; a small gap in between ventral side of valvae and vinculum; below the vinculum no hook-like structure; there is a large, rounded structure (a kind of valval apodeme ?) above the juxta, attached to the upper lobe and vinculum, the dorsal surface of this structure is covered with setae; sacculus small, narrow; uncus broad, triangular (viewed ventrally), elongated (viewed laterally), bifid, tips acuminate with long setae, emargination small, rounded; juxta broad, shaped as a half-moon with two acuminate tips. Aedeagus simple, funnel-like, very broad and rounded basally, narrow and rounded distally; vesica without cornuti.

Diagnosis: *A. dupreezi* spec. nov. has a large wing size and is currently the largest *Arbelodes* known from Namibia. It has two peculiar features: Firstly, a small saccus with three rounded tips (viewed ventrally) and secondly, the upper lobe, that is not bent, but stands upright towards the uncus. It is related to species from the Cape Floristic Region, in particular to *A. agassizi* spec. nov. and to *A. heringi* (Janse) from Windhoek. The antenna-wing ratios of 0.64:1 in *A. dupreezi* spec. nov., 0.65:1 in *A. agassizi* spec. nov. and 0.70:1 in *A. heringi* are high. Common characters in the male genitalia of the first two species comprise the short, funnel-like aedeagus; the two lobes of which the lower one is thorn-like; the gap in between the ventral side of the valvae and vinculum and the broad uncus (viewed ventrally). Similar to *A. heringi* is the large and rounded structure (a kind of valval apodeme ?) above the juxta as well as the small and rounded emargination in the uncus.

Habitat: Farm Aar (altitude 1500-1650 m; mean annual rainfall generally 80-100 mm; mainly January-June) is located in southwestern Namibia, *ca.* 30 km southeast from Aus and on the northern end of the Huib-Hoch Plateau. Winter snowfalls are common and minimum temperatures may drop well below freezing. The Huib-Hoch Plateau is a prominent chain of large flat-topped limestone hills that reaches 1800 m at its highest point in the north and lies at an altitude of *ca.* 1200 m in the south. The vegetation of these hills belongs to the *„Desert and Succulent Steppe" sensu* Giess (1971). The larger area is part of the *„Karoo-Namib regional centre of endemism" sensu* White (1983). The landscape near the Farm Aar is very ancient. This is indicated by the occurrence of rocks of 1500 million year old gneisses of the Namaqua Metamorphic Complex with resultant shallow, coarse-textured lithic leptosol soils. The only record of a specimen of the *Ediacara* fauna (534 myr old) was found in the Namib Huib Plateau Park. This conservation area is located *ca.* 30 km south from Aus and borders the Sperrgebiet for *ca.* 90 km, but stretches eastwards onto the Huib-Hoch Plateau. Large parts of the Namib Huib Plateau Park, and probably of the Farm Aar, belong to one of the 34 world's hotspots of biodiversity. This is the *„Succulent Karoo"* (Desmet & Cowling, 2004). Its arid lands harbour 6356 plant species and the richest succulent flora worldwide. The flora is mainly transitional between the Cape Floristic Region and the Nama-Karoo, with a stronger affinity to the former. Two characteristic features are noteworthy: Firstly, the very high diversity of leaf succulents (*ca.* 1700 species) and secondly, the mima-like mounds with a distinct flora. There is also a high number of endemic species among the fauna, *e.g.,* in insects >50 %. Several families are typical for the area, including the Mesembryanthemaceae (many genera), Crassulaceae, Euphorbiaceae, Asteraceae and Liliaceae. Farm Aar has largely a sub-desert, karroid vegetation with barren land and grasslands (towards the Aus escarpment and westwards along or close to the eastern Namib desert margin) and scattered trees of *Aloe dichotoma* Masson. Trees of *Acacia erioloba* E. Mey. lining dry river beds. Legumes of the genera *Sutherlandia* and *Chamaecrista* can be expected to occur (Ş. Procheş, pers. comm.). The author has not found any vegetation study east or south from Aus. Others would be misleading due to a completely different geology to the west and north from Farm Aar. The Aus Mountains, for example, are part of a granitic formation that is completely separated from the dolomitic Huib-Hoch Plateau by a sandy plain *ca.* 10 km across at the narrowest point. This plain probably represents a significant barrier to the dispersal of *A. dupreezi* spec. nov.

Ecology: *A. dupreezi* spec. nov. is classified as a montane species. Its arid habitat is associated with desert shrubland, in particular with a barren plateau, characterized by a mixture of a sparse tree, shrub and grass layer. The very diverse succulent vegetation is outstanding.

Distribution: *A. dupreezi* spec. nov. is known only from Farm Aar. It is classified as an endemic species of the *„Karoo-Namib regional centre of endemism"*. Since close related species occur in the *„Cape Floristic Region"* as well as around Windhoek, it is expected that its range extends further south and north from the Huib-Hoch Plateau. However, on account of the arid environment, with its very limited distribution possibilities, *A. dupreezi* spec. nov. might be endemic to the *"Namaqualand-Namib Domain" sensu* Jürgens (1991). The latter is a subdivision of Jürgens (1991) *"Succulent Karoo Floristic Region"*.

PRELIMINARY KEY TO THE SOUTHERN AFRICAN SPECIES OF *ARBELODES*

The key is based exclusively on morphological characters. As for the majority of the 22 species only one or a few specimens are available, identifications obtained with this key should be cross-checked carefully with the description, distribution and the figures presented in this paper. For the same reason external features alone cannot be used for a determination.

Group A: Males with two lobes, antenna-wing ratio at least 0.50:1 and below 0.55:1

1. Forewing (=Fw) upperside without geometric design; uncus broad, edge serrate; saccus long, *ca.* one-third of lower lobe — *meridialis*

- Fw upperside with geometric design; saccus long, *ca.* one-third of lower lobe — ... 2

2. Large triangular and rectangular patches, leaf-like or needle-like pattern on Fw;
- edge of uncus not serrate; two narrow thorn-like lobes — *sticticosta*
- edge of uncus not serrate; two thorn-like lobes with a small "third" lobe — *deprinsi* sp. nov.

- Fw upperside without geometric design; saccus small or absent — ... 3

3. Hindwing (=Hw) upperside colourful (*e.g.*, orange, yellow, old gold)
- light orange-yellow — *flavicolor*

- Fw and/or Hw with a geometric design, Hw not colourful; saccus small or absent — ...4

4. Triangular or rectangular patches, thorn-like and T-like patterns
- Hw with a thorn-like pattern — *albitorquata*
- Fw with a small patch below half of costa; hole at base of uncus; four small thorns on tegumen — *iridescens*
- small species with a short Fw — *dicksoni* spec. nov.

- Hw upperside neither colourful, nor with a geometric design — ...5

5. Uncus extremely short
- uncus resembling a face of a cat (viewed laterally) — *collaris*
- uncus not similar to a face of a cat; basal end of lower lobe square-shaped — *prochesi* spec. nov.

Group B: Females including two species of group A and one species of group C

1. Fw with a geometric design
- Triangular and rectangular patches, thorn-like pattern, postabdominal structure with a rudimentary (extremely small) anterior apophysis — *sebelensis* spec. nov.

- Fw almost without, Hw without a geometric design; anterior apophysis short — ...2

2. Geometric design reduced to a few rectangular or triangular patches
- Gap in postabdominal structure elongated, broad, upper half rounded — *claudiae* spec. nov.
- Gap elongated, narrow, anterior apophyses S-shaped — *meridialis*

- Fw and Hw with geometric design; anterior apophyses short — ...3

3. Leaf-like, thorn-like or T-like patterns on the whole Fw and along edge of Hw
- Gap in postabdominal structure strongly reduced, short and narrow — *albitorquata.*

Group C: Males with three lobes, antenna-wing ratio at least 0.50:1 and below 0.55:1

1. Fw with a geometric design
- Fw colourful, old gold, white thorn-like pattern, rounded and rectangular patches — *claudiae* spec. nov.

- Fw upperside without a geometric design, not or only a little colourful — ...2

2. Fw not colourful
- Three thick lobes covered with setae — *griseata*

- Fw upperside a little colourful — ...3

3. Three narrow lobes present
- Small patches of orange-buff on Fw; very narrow lobes, on top with scale-like structures — *mondeensis* spec. nov.
- Many different shades of grey and white on Fw; lobes on top with long setae — *kroonae*

Group D: Males with two lobes, antenna-wing ratio at least 0.55:1 and not above 0.60:1

- Fw elongated — ...1

1. Fw without geometric design
- Fw a little colourful with a small spot of pinkish buff — *haberlandorum* spec. nov.

- Fw with a silvery glint — ...2

2. Fw with a geometric design of rounded and rectangular patches, thorn-like, T-like patterns
- Fw with an extremely silvery glint — *shimonii* spec. nov.

Group E: Males with two lobes, antenna-wing ratio at least 0.60:1 and above 0.70:1

- Antenna-wing ratio below 0.70:1 — ...1

1. Fw without geometric design
- Fw short — *varii* spec. nov.
- Fw elongated; the upper lobe stands vertical towards the uncus — *dupreezi* spec. nov.

- Fw with a geometric design of lunules — ...2

2. Lunules white
- a large triangular gap in between lower base of valvae and vinculum — *agassizi* spec. nov.
- a gap in between lower base of valvae and vinculum absent, but present at base of uncus — *kruegeri* spec. nov.

- Antenna-wing ratio at least 0.70:1 — ...3

3. Fw without geometric design
- Fw elongated — *franziskae* spec. nov.

- Fw with a geometric design — ...4

4. Fw with rounded, rectangular, thorn-like patterns
- Fw short — *heringi.*

DISCUSSION

Distribution pattern in context to woody Leguminosae

Arbelodes is one of the larger genera among the Metarbelidae, currently comprising 22 species, of which 20 occur exclusively in southern Africa as defined by Goldblatt (1978). Hence, it is essentially endemic to southern Africa. Its northern or northeastern limit, respectively, is represented by a single species, namely *A. claudiae* spec. nov., which occurs in northern Malawi and extends northwestwards to Mbala (formerly Abercorn) in northeastern Zambia. Currently, *Arbelodes* is the only genus of the Metarbelidae that occurs predominantly in the montane zone of temperate and subtropical regions of southern Africa with only minor extensions into mountainous areas of southern tropical Africa. Although the genus *Teragra* is also most diverse in southern Africa, and is often sympatric with *Arbelodes*, the former extends well into the tropical regions of eastern Africa, including at least five species that occur from northwestern Tanzania to southern Uganda and to central Kenya. All the remaining Afrotropical genera of the Metarbelidae belong to a reverse class, predominantly including species that occur in tropical regions. Interestingly, one of the two largest genera, namely *Metarbela*, is under-represented or absent from areas were the genus *Arbelodes* has been recorded. For example, only two *Metarbela* species are known from South Africa, and no species have been recorded so far from the Cape Floristic Region and from the Great Escarpment-Drakensberg. Only two *Metarbela* species are known from southern Namibia, perhaps extending into adjacent areas of South Africa. This supports the author's field observations made in Kenya, that predominantly tropical genera, like *Metarbela*, are closely linked to woody legumes (Lehmann & Kioko, 2005; Lehmann, 2008a, b; Lehmann, 2010). Woody legumes are under-represented in those areas where a high diversity and endemism of *Arbelodes* have been found, *e.g.*, in the Cape Floristic Region as well as in the forests and thickets of the Great Escarpment-Drakensberg. One reason is that genera as *Amblygonocarpus*, *Baikiaea*, *Brachystegia*, *Julbernardia* and *Guibourtia* are largely tropical African; extending only into northern Namibia, northeastern Botswana and extreme northeastern South Africa. For example, only two species of the widespread *Brachystegia*, only one species of *Julbernardia* and no *Tamarindus* occur in South Africa. The Leguminosae of the Cape Floristic Region are comprised of mainly herbs and shrubs of the Papilionoideae, with a great development of Crotalarieae and Liparieae (Goldblatt, 1978). Among the southern African subtropical thicket vegetation, the woody legumes are also under-represented. Only one woody genus that is commonly present in thicket is *Schotia*, associated with semi-arid vegetation, as well as the narrow Eastern Cape endemic *Umtiza listeriana* Sim (Caesalpinioideae) (Cowling *et al.*, 2005). Currently, comparatively few *Arbelodes* species are known to occur in southern African savannas. In this context it is important to note, that those legumes that are dominant in savannas today (*e.g.*, Mimoseae, Acaciae, Indigofereae) were also dominant, prior to grass invasion, in African dry forest ecosystems as far back as 46 myr BP (Herendeen & Jacobs, 2000). Since *Arbelodes* is absent from large tropical savanna areas, but most diverse in the Cape Floristc Region and on the Great Escarpment-Drakensberg, it must be linked to the warm temperate and/or subtropical southern African elements that characterize these areas. Warm temperate elements include the southern African conifer genera, *Podocarpus* and *Widdringtonia*, where the former is a pre-Cretaceous relict. Both genera are part of Afrotemperate forests that extend in a patchy feature from the Cape Floristic Region via to the Afromontane Region towards the equator, but *Widdringtonia* extends only to Malawi, where *Juniperus*, a northern temperate element, becomes more common northwards. The *Arbelodes* species described herein, from the Cederberg, from Impetyeni Forest, from the Balgowan forest complex (South Africa) and the *Juniperus* forest (northern Malawi) are certainly linked to these ancient conifer genera, but less so to the woody legumes (*cf.* habitat descriptions above). Subtropical southern African elements are particularly common in thickets that include a remarkable succulent component. What is of importance is, that the vast majority of thicket vegetation are plants of Eocene age. These include the Celastraceae as the most diverse family among woody thicket species. Large areas of the Cape Floristic Region are covered by fynbos (dominated by Ericaceae, Geraniaceae, Restionaceae, Proteaceae) with many elements derived from thicket/forest lineages (Cowling *et al.*, 2005). Only regular fires maintain most of the fynbos areas, which are otherwise suitable for Afrotemperate forest. The Ericaceae originated in western Gondwanaland, and, like the other three families, they are poorly represented outside of the Cape Floristic Region. Hence, a close relationship between these

four typical fynbos families and the genus *Arbelodes* appears to be unlikely, because *Arbelodes* is also well represented outside of the Cape Floristic Region, in particular on the Great Escarpment-Drakensberg.

Relationships to other genera of the Metarbelidae

At this stage the author found no morphological characters among *Arbelodes* that indicate a close relationship to any of the tropical African genera. This shows that *Arbelodes* originated and developed in southern Africa. An outstanding feature of *Arbelodes* is that it includes species with and without a geometric design, as well as with and without colourful hindwings, and hence the wing pattern of species it does not resemble closely. This is a remarkable contrast to all other genera. Great morphological differences exist to species of the genus *Teragra* which have very often a frenulum as well as extremely strong veins. *Arbelodes* is outstanding among the Metarbelidae at the moment.

Diversity

It is to be expected that the total number of *Arbelodes* will increase. It is very likely that another 25-50 new species will be discovered in southern Africa. Some *Arbelodes* species might be locally common, but the majority are most probably rare. Potential habitats with a high number of new and endemic species are located, in particular, on the Great Escarpment-Drakensberg and its adjacent areas (in old stands of Afrotemperate forests, or in a mosaic of grassland with embedded patches of Afrotemperate forest and/or southern African subtropical thicket); in the Cape Floristic Region and among the karroid vegetation of southern Namibia. Locally, the number of endemic species is certainly high, *e.g.*, on the Cederberg, where five endemic species are known. Nevertheless, the majority of the 22 species have probably a scattered occurrence, small ranges and appear to be local and/or rare endemics. This is an unusual distribution pattern for a whole genus and indicates the relict character of *Arbelodes*.

***Arbelodes* - a potential Gondwana or Cretaceous relict**

Based on the following five facts, the author assumes that the genus *Arbelodes* is of great antiquity, with its nuclei of Gondwana or Cretaceous origin:

Firstly, *Arbelodes* is not a tropical genus, but originated in southern Africa. The majority of species occur in montane zones and in ancient vegetation types of South Africa and southern Namibia with largely subtropical/temperate elements (*cf.* Table 1). There is a general rule, namely that those *Arbelodes* of the Great Escarpment-Drakensberg (*A. sticticosta*, *A. albitorquata*, *A. deprinsi* spec. nov., *A. griseata* and *A. iridescens*) are largely endemic to this mountain complex and they have no relations to genera and/or species occurring in the Afromontane Region north from the plateau areas near the southern shores of Lake Tanganyika. *Arbelodes prochesi* spec. nov. is closely related to these five species and is known from the Eastern Highlands of Zimbabwe. In the African context, *Arbelodes* is predominantly an Afromontane genus, but it is only Afromontane because White (*e.g.*, 1983) included the Great Escarpment-Drakensberg as the southernmost system into one of his seven Afromontane archipelago-like mountain systems, stretching in case of the Drakensberg mountain complex, from the Soutpansberg in the northeast to Knysna in the south. The Great Escarpment-Drakensberg and the Eastern Highlands of Zimbabwe represent landscapes which are older than the African cycle of erosion and the higher peaks are considered to be remnants of the Jurassic/Gondwanan surface (Agnew, 1958; Partridge & Maud, 1987). In terms of geomorphology, the Great Escarpment-Drakensberg with its very scarp slopes, is considered the oldest feature of the Great Karoo, representing a passive relict of the Gondwana continental margin (Matmon *et al.*, 2002).

Secondly, *Arbelodes* occurs outside southern Africa, but only on plateau areas or in the Afromontane Region. The northeastern limit is the plateau around Mbala, which is not far from evergreen forest relicts of chipya vegetation and Pleistocene forest refuges, close to the southeastern shores of Lake Tanganyika (Trapnell, 1943; Lawton, 1963). Lowland species are only known from the Eastern and Western Cape provinces in South Africa. Such a distribution pattern indicates a

relict character and very ancient adaptations to the climate of the Afromontane Region, which is temperate across its entire area. Seventeen species occur south of the 24th parallel of latitude where frost, snow and cold, rainy winters are common. A few species occur even in arid, very hot environments. Adaptation to such extreme climates must be very ancient and linked to an Africa that was some 15° to the south in the late Cretaceous and Paleocene (71-64 myr BP), until it reached its present position 30-25 myr BP. The higher diversity and endemism in montane zones of southern Africa can not only be explained by a moister climate, often with a mist effect at higher altitudes, but also by a stable geological structure. For the latter, its main topographical features have not changed since Mid-Tertiary times. From the late Miocene onwards, the climate of southern Africa became colder and drier as a consequence of growth of the Antarctic ice sheet and the development of the Antarctic circumpolar current. *Arbelodes* occurring at present in savannas, *e.g.*, around Pretoria, Mokopane and Sebele, are most probably all relicts and indicators of woodlands or thickets that were replaced by more open savanna by the end of the Pliocene (Vrba, 1985).

Thirdly, *Arbelodes* is historically neither an arid nor a semi-arid element. From the Miocene onward, the climate of southern Africa became more arid and drought-adapted species evolved, particularly at lower elevations. The genus *Arbelodes* is not originally linked to arid lands, and hence, must be much older than the Tertiary, when desert and semi-desert conditions extended from southern Africa far towards the equator, resulting in a vast arid area surrounded by dry grassland merging into savanna (Van Zinderen Bakker, 1976). During the Tertiary and during dry glacial times, there was a broad *"drought corridor"* (Balinsky, 1962), stretching from the Western Cape and Namibia unbroken northeasterly to the Somali Peninsula. Van Zinderen Bakker (1975) later termed this the *"Arid Corridor"*. An important fact regarding the *Arbelodes* is that this corridor was open several times for the migration of semi-arid and arid elements through a gap between the Tanganyika and Malawi lakes. This gap is exactly the distribution range of *A. claudiae* spec. nov. Interestingly, this species does not occur in Somalia, Kenya and Tanzania, nor in the Western Cape Province or Namibia. This indicates that *Arbelodes* is certainly not an arid, nor a semi-arid element of Africa, because it would have migrated via this corridor. That this did not happen is also indicated by the absence of any related genera or species in Kenya, Somalia and on the Arabian Peninsula. Hence, *Arbelodes* stands on its own and survived mainly in montane zones, which must have not lost all its forests or woodlands during the Antarctic glacial maxima of the Tertiary age and during the Quaternary glaciations.

Fourthly, *Arbelodes* is not linked to a tropical wet forest vegetation. It is closely linked to ancient temperate/subtropical forest and thicket vegetation with a succulent component. Southern Africa was covered by larger forests or open woodlands, dominated by mixed gymnosperm-angiosperm types during the Cretaceous-Palaeocene. Gymnosperms were abundant, *e.g.*, at Banke (Namaqualand) with Araucariaceae and Podocarpaceae (Scotese, 2001; Cowling *et al.*, 2005). Some of the *Arbelodes* occurring in South Africa are linked to natural forest patches, where the genus *Podocarpus* is common, or to southern African subtropical thicket vegetation embedded in a grassland matrix. Southern African thicket is part of an ancient, xeric manifestation of Upper Cretaceous to early Paleogene warm temperate and subtropical forest flora. The genera *Encephalartos* and *Strelitzia* are most likely Cretaceous relicts with highest diversities along the eastern side of the Great Escarpment-Drakensberg, Eastern Highlands of Zimbabwe and southern Cape (Cowling *et al.*, 2005).

Fifthly, *Arbelodes* is the only genus that includes remarkably contrasting species, indicating a development within the genus over long periods of time. It comprises species of at least three groups: Firstly, those in which a geometric design is entirely absent; secondly, those where a geometric design on the forewings is often combined with a very strong silvery glint shine; and finally, species without a geometric design, but with colourful hindwings. Species of different groups occur in a sympatric manner, in particular in the Cape Floristic Region and in the southern part of the Eastern Cape Province. This might indicate several speciation events, perhaps over a very long period.

Table 1: Potential endemism, altitude range and main vegetation types of 22 species of the genus *Arbelodes*

Species	Altitude range	Main vegetation types and habitats
Arbelodes meridialis Karsch, 1896 endemic to South Africa (southeastern part only ?)	from near sea-level to 1500 m, lowland to montane	Suurberg Shale Fynbos; Besemkaree Koppies Shrubland; ericoid shrublands; Cape thickets; southern African subtropical thickets
Arbelodes sticticosta (Hampson, 1910) endemic to South Africa and Lesotho (probably to the Great Escarpment-Drakensberg and its foothills)	700 m – 1200 m submontane to montane	Afrotemperate forest types; Southern Mistbelt Forest embedded in a grassland matrix; Midlands Mistbelt Grassland; thornveld with termitaria and grassland; wooded grassland (Afromontane)
Arbelodes flavicolor (Janse, 1925) a rare species; endemic to South Africa (Maputaland-Pondoland endemic ?)	1650 m montane	Southern Mistbelt Forest
Arbelodes deprinsi spec. nov. endemic to South Africa, Lesotho; Great Escarpment-Drakensberg	1255 m montane	Drakensberg Foothill Moist Grassland with Northern Afrotemperate Forest patches and *Protea* ssp.
Arbelodes albitorquata (Hampson, 1910) endemic to South Africa and Lesotho (Great Escarpment-Drakensberg only ?)	1300 – 1760 m montane Note: Janse (1925) mentioned a record from Durban (a lowland relict population or a different species ?)	Camdebo Escarpment Thicket; Amathole Mountain Grassland; Andesite Mountain Bushveld; short montane grassland with woody thickets and Northern Afrotemperate Forest
Arbelodes collaris Aurivillius, 1921 potential endemic to South Africa	1100 m montane	Makhado Sweet Bushveld; shrubby bushveld with poorly developed grass layer
Arbelodes prochesi spec. nov. disjunct distribution, Eastern Highlands of Zimbabwe and Kalomo (Zambia)	1200 – 1800 m montane	Miombo with dambo grassland and riverine woodland; mixed montane forest; legume-dominated forest
Arbelodes sebelensis spec. nov. relict distribution in eastern Botswana and western South Africa ?	900-1000 m submontane	Dwaalboom Thornveld; Kalahari Thornveld; deciduous, microphyllous trees and shrubs embedded in grassland, few broad-leaved trees
Arbelodes claudiae spec. nov. currently the most northern species; northern Malawi, northeastern Zambia	1250-2215 m montane to upper montane	*Juniperus procera* forest remnants; admixture of miombo, chipya and riparian forest; forest remnants with Afromontane species
Arbelodes griseata (Janse, 1925) potential endemic to South Africa	1150-1750 m montane	Gold Reef Mountain Bushveld; subtropical savannas of the Central Bushveld; Tzaneen Sour Bushveld; dense tree/shrub layers with grass and succulent herbs; mainly with woody legumes

Species	Altitude range	Main vegetation types and habitats
Arbelodes mondeensis spec. nov. endemic to South Africa, Albany Centre	0-73 m lowland	Kowie Thicket; Albany Coastal Belt; woody legumes mixed with succulent euphorbias
Arbelodes iridescens (Janse, 1925) endemic to South Africa (Drakensberg only ?)	1200-1350 montane	Lydenburg Montane Grassland with Northern Mistbelt Forest patches, thickets and *Protea* spp.; savannas of the Central Bushveld adjacent to montane grasslands of the Drakensberg
Arbelodes haberlandorum spec. nov. endemic to South Africa Cape Floristic Region (Cederberg only ?)	517 m submontane (and montane ?)	Citrusdal Vygieveld; riparian woodland with elements of the Southern Afrotemperate Forest, Cape thicket and Succulent Karoo
Arbelodes shimonii spec. nov. endemic to South Africa Cape Floristic Region (Cederberg only ?)	517 m submontane (and montane ?)	Citrusdal Vygieveld; riparian woodland with elements of the Southern Afrotemperate Forest, Cape thicket and Succulent Karoo
Arbelodes dicksoni spec. nov. endemic to South Africa (Cape Floristic Region only ?)	0-350 m lowland and submontane	Peninsula Shale Renosterveld; open shrubland with Cape thicket elements and regular fires
Arbelodes varii spec. nov. endemic to South Africa (Cape Floristic Region only ?)	5-25 m (up to 331 m ?) lowland (and submontane ?)	Cape Seashore Vegetation; Cape Flats Sand Fynbos; a diverse dwarf woody, succulent element, many *Protea* spp.
Arbelodes franziskae spec. nov. endemic to South Africa Cape Floristic Region (Cederberg only ?)	517 m submontane (and montane ?)	Citrusdal Vygieveld; riparian woodland with elements of the Southern Afrotemperate Forest, Cape thicket and Succulent Karoo
Arbelodes agassizi spec. nov. endemic to South Africa Cape Floristic Region (Cederberg only ?)	517 m submontane (and montane ?)	Citrusdal Vygieveld; riparian woodland with elements of the Southern Afrotemperate Forest, Cape thicket and Succulent Karoo
Arbelodes kruegeri spec. nov. endemic to South Africa Cape Floristic Region (Cederberg only ?)	517 m submontane (and montane ?)	Citrusdal Vygieveld; riparian woodland with elements of the Southern Afrotemperate Forest, Cape thicket and Succulent Karoo
Arbelodes heringi (Janse, 1930) endemic to Namibia	1700 m montane	Highland Savanna; woody legumes; a diverse shrub layer; specific flora on outcrops; a diverse geophytic flora
Arbelodes dupreezi spec. nov. endemic to Namibia (only Namaqualand-Namib Domain ?)	1500-1650 m montane	Succulent Karoo; sub-desert, karroid vegetation; trees limited to dry river beds; very diverse (leaf) succulent flora
Arbelodes kroonae Lehmann, 2007 endemic to Namibia; in the Ai-Ais NP close to Pleistocene refuge areas of the West/ East Gariep	600-1100 m submontane-montane	Richtersberg Mountain Desert; Nama-Karoo flora; bare rocks with scattered low trees and a very diverse leaf-succulent flora, rich in *Euphorbia*

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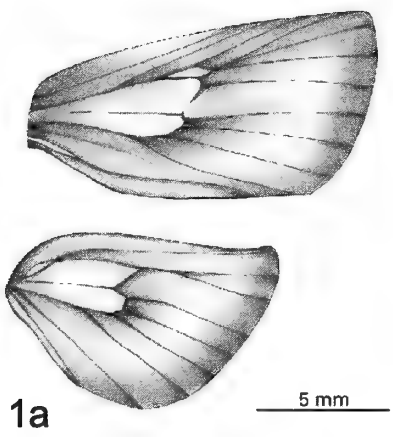

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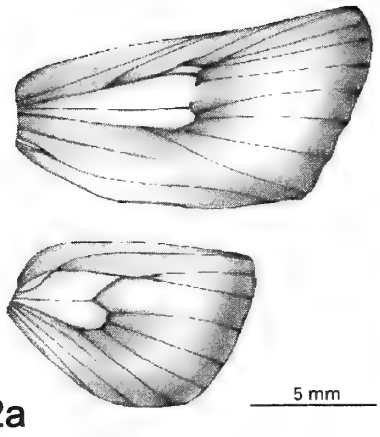

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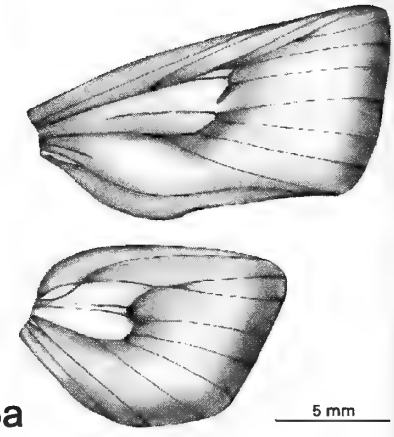

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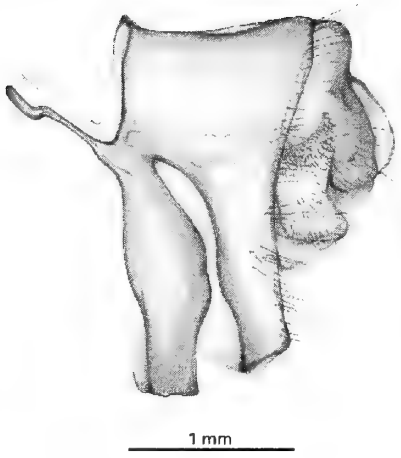

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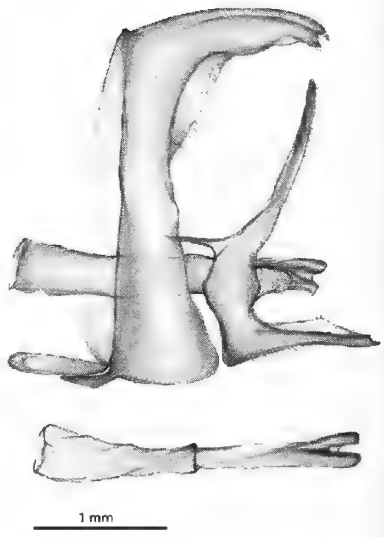

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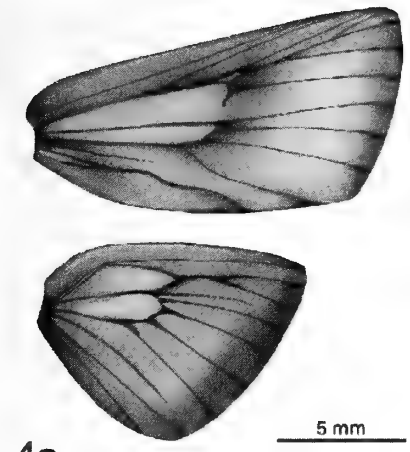
Figure. 1a. Wing venation of: *Arbelodes meridialis* Karsch (1896), male; 2a *Arbelodes meridialis* Karsch (1896), female; 3a. *Arbelodes sticticosta* (Hampson, 1910), male.

Figure. 1b. Genitalia of: *Arbelodes meridialis* Karsch (1896), male; 2b *Arbelodes meridialis* Karsch (1896), female; 3b. *Arbelodes sticticosta* (Hampson, 1910), male.



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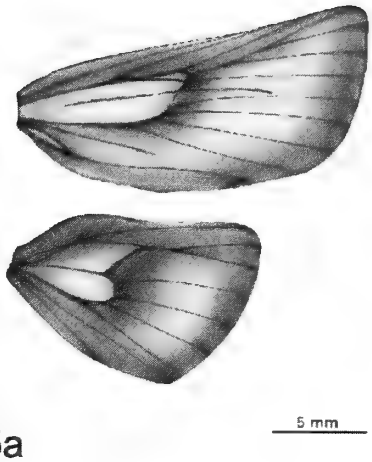

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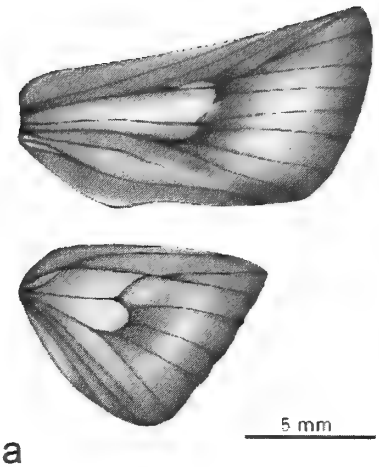

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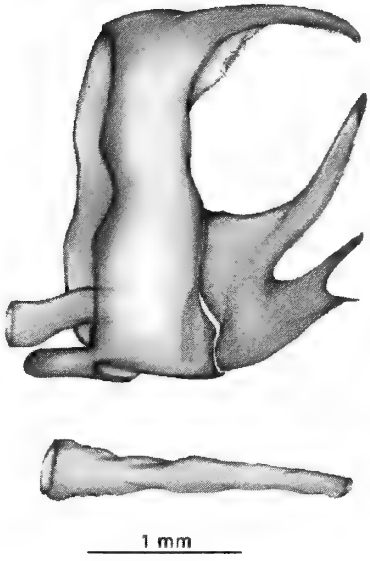

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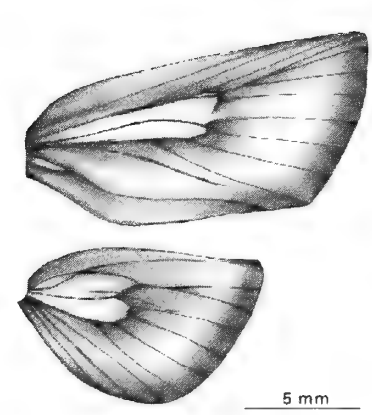
6b

Figure. 4a. Wing venation of: *Arbelodes flavicolor* (Janse, 1925), male, holotype; 5a *Arbelodes deprinsi* spec. nov., male, holotype; 6a. *Arbelodes albitorquata* (Hampson, 1910), male.

Figure. 4b. Genitalia of: *Arbelodes flavicolor* (Janse, 1925), male, holotype; 5b *Arbelodes deprinsi* spec. nov., male, holotype; 6b. *Arbelodes albitorquata* (Hampson, 1910), male.



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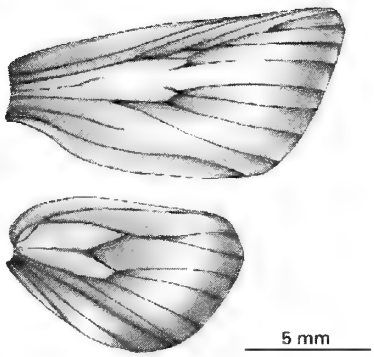

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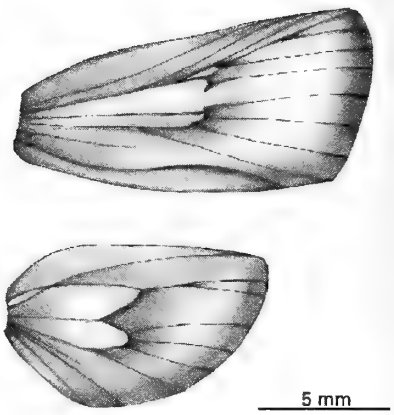

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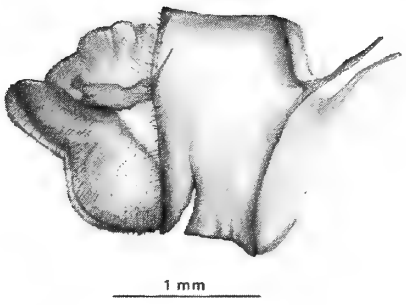

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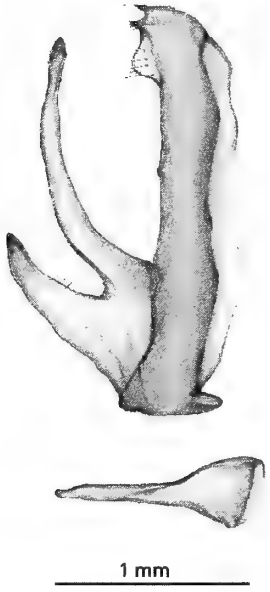

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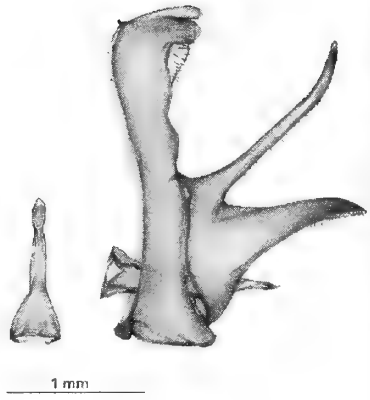
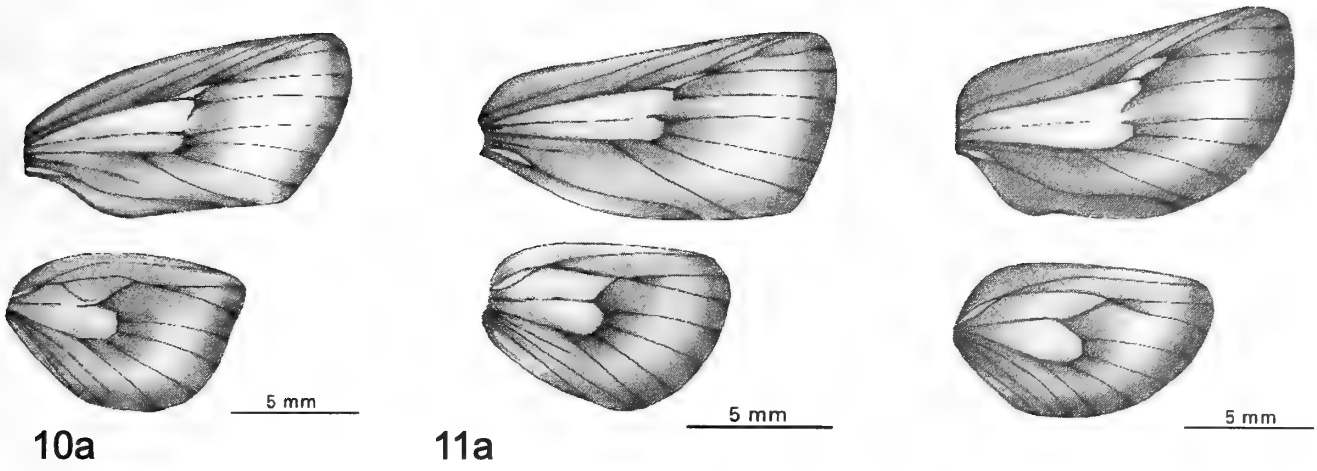


9b

Figure. 7a. Wing venation of: *Arbelodes albitorquata* (Hampson, 1910), female; 8a. *Arbelodes collaris* Aurivillius (1921), male, co-type; 9a. *Arbelodes prochesi* spec. nov., male, holotype.

Figure. 7b. Genitalia of:*Arbelodes albitorquata* (Hampson, 1910), female; 8b.*Arbelodes collaris* Aurivillius (1921), male, co-type; 9b. *Arbelodes prochesi* spec. nov., male, holotype.



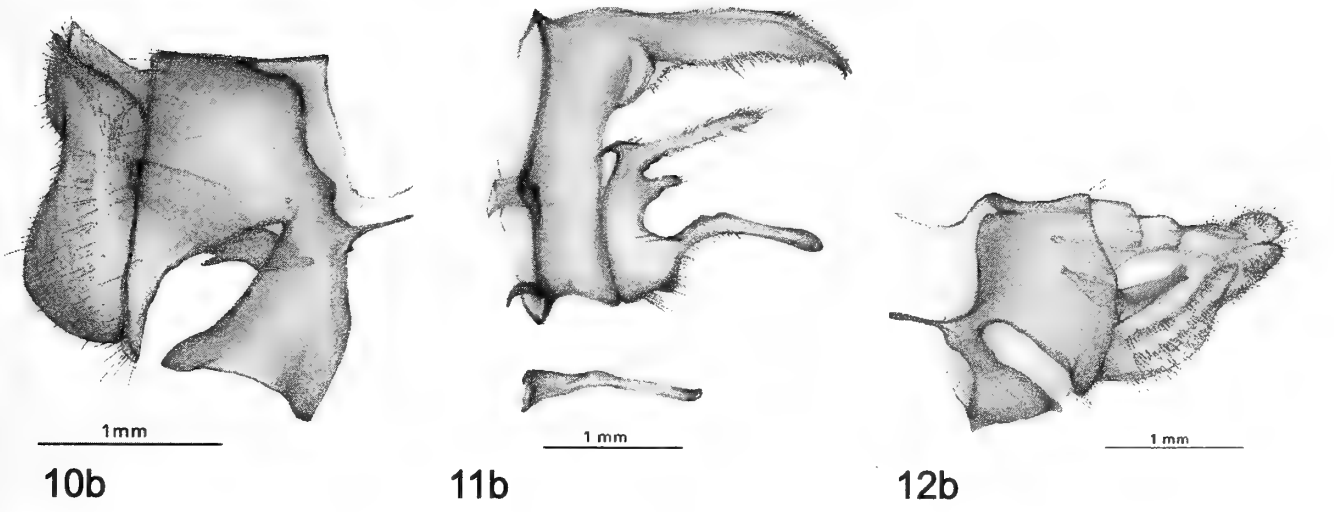
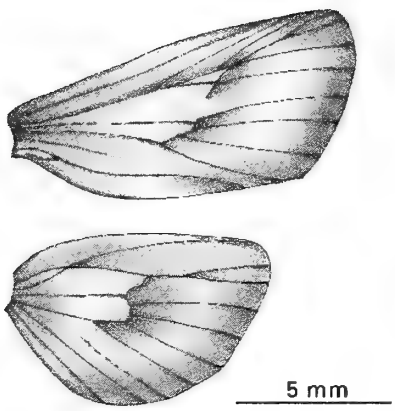


Figure. 10a. Wing venation of:*Arbelodes sebelensis* spec. nov., female, holotype; 11a.*Arbelodes claudiae* spec. nov., male, holotype; 12a. *Arbelodes claudiae* spec. nov., female, paratype.

Figure. 10b. Genitalia of: *Arbelodes sebelensis* spec. nov., female, holotype; 11b. *Arbelodes claudiae*spec. nov., male, holotype; 12b. *Arbelodes claudiae* spec. nov., female, paratype.



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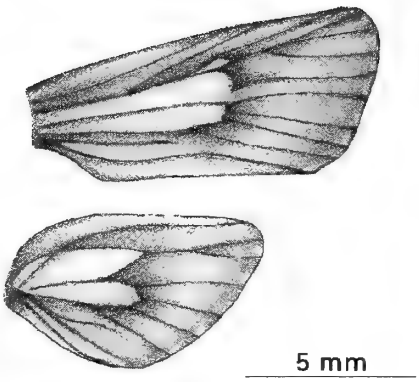

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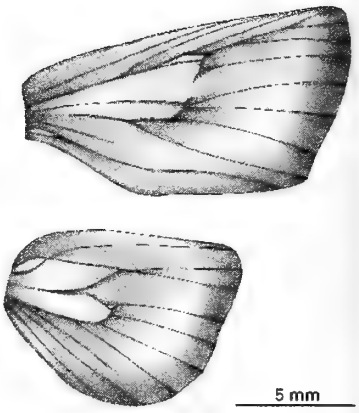
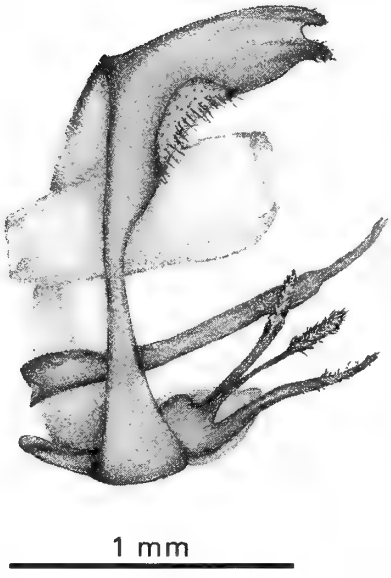


15a

13b

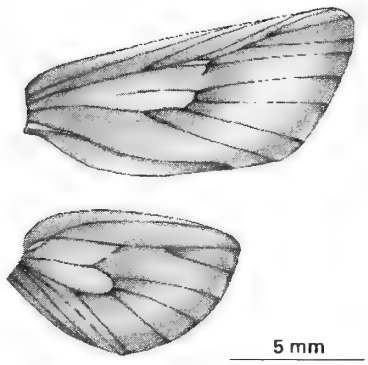


14b

15b

Figure. 13a. Wing venation of: *Arbelodes griseata* (Janse, 1925), male; 14a. *Arbelodes mondeensis* spec. nov., male, holotype; 15a. *Arbelodes iridescens* (Janse, 1925), male.

Figure. 13b. Genitalia of: *Arbelodes griseata* (Janse, 1925), male; 14b. *Arbelodes mondeensis* spec. nov., male, holotype; 15b. *Arbelodes iridescens* (Janse, 1925), male.



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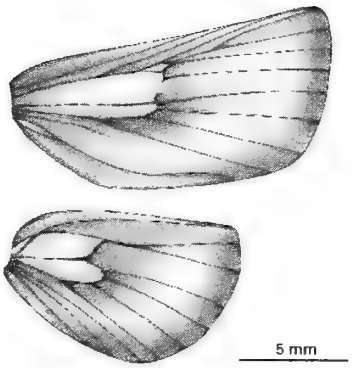
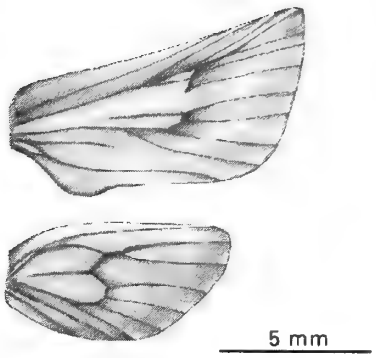
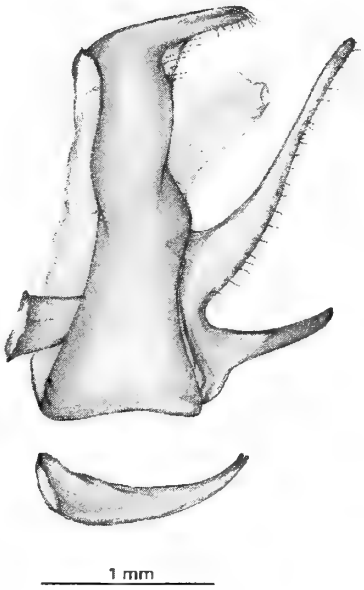


17a



18a

16b

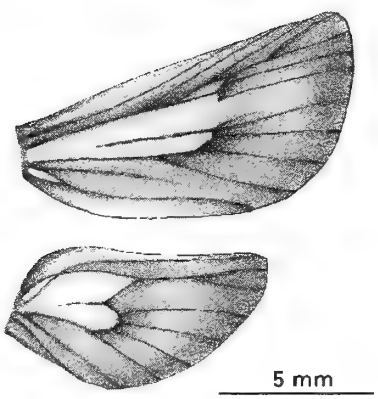


17b

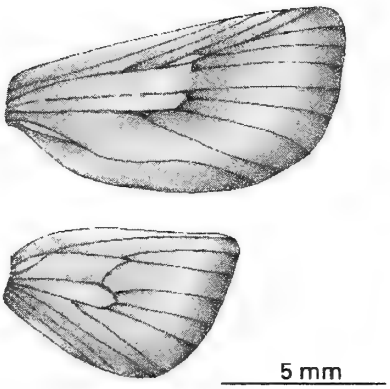
18b

Figure. 16a. Wing venation of: *Arbelodes haberlandorum* spec. nov., male, holotype; 17a. *Arbelodes shimonii* spec. nov., male, holotype; 18a. *Arbelodes dicksoni* spec. nov., male, holotype.

Figure. 16b. Genitalia of:*Arbelodes haberlandorum* spec. nov., male, holotype; 17b.*Arbelodes shimonii* spec. nov., male, holotype; 18b. *Arbelodes dicksoni* spec. nov., male, holotype.



19a



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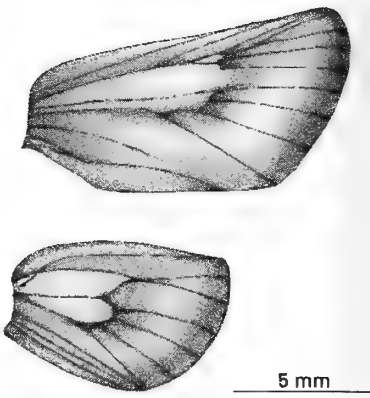

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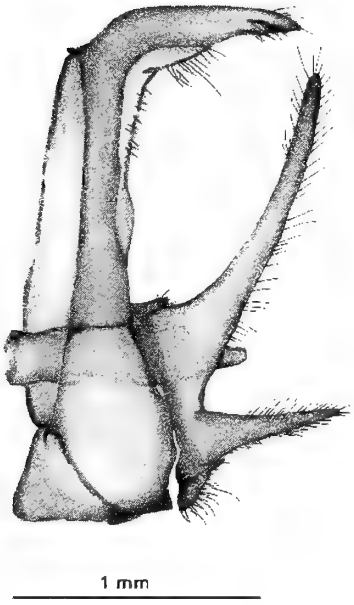

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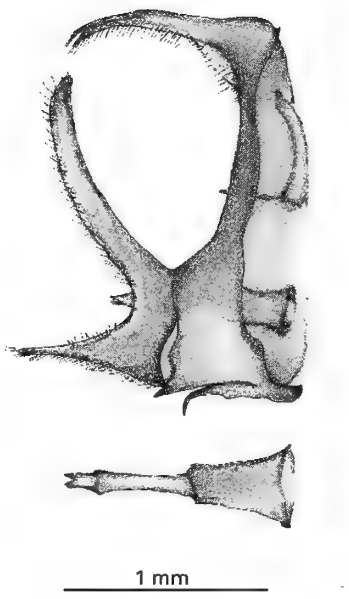

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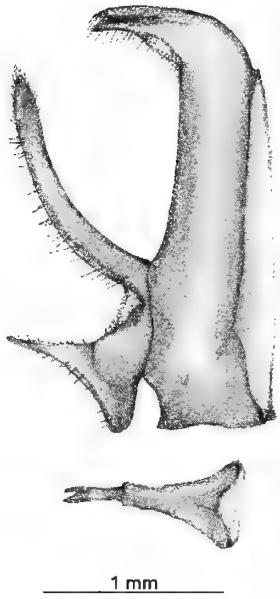
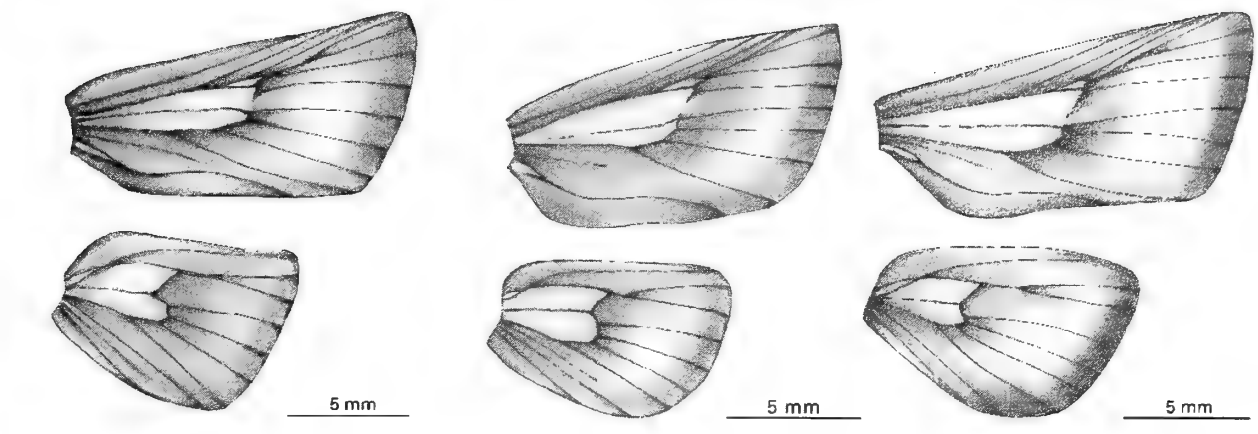


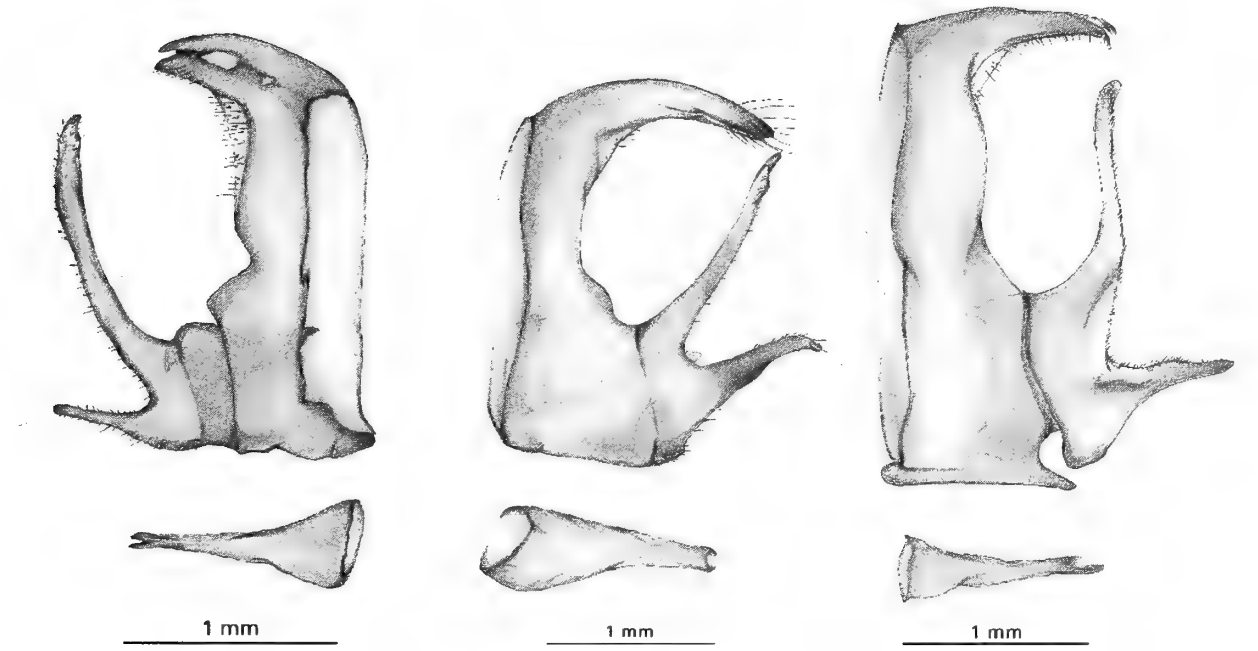
21b

Figure. 19a. Wing venation of: *Arbelodes varii* spec. nov., male, holotype; 20a. *Arbelodes franziskae* spec. nov., male, holotype; 21a. *Arbelodes agassizi* spec. nov., male, holotype.

Figure. 19b. Genitalia of: *Arbelodes varii* spec. nov., male, holotype; 20b. *Arbelodes franziskae* spec. nov., male, holotype; 21b. *Arbelodes agassizi* spec. nov., male, holotype.



22a 23a 24a

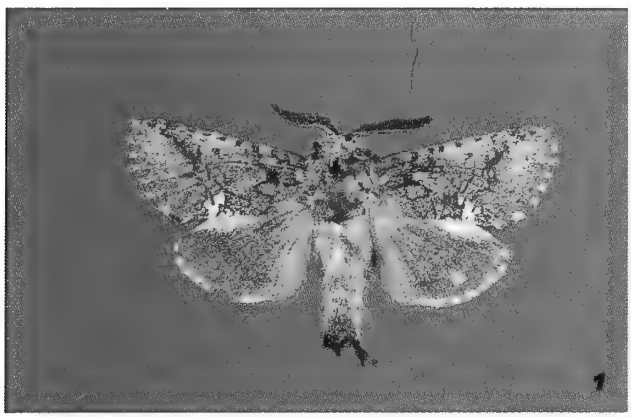


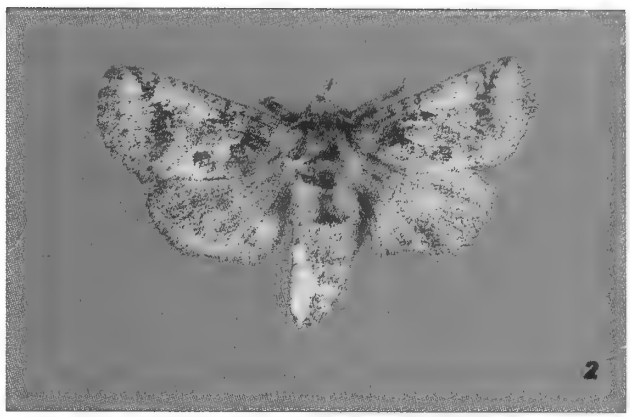
22b 23b 24b

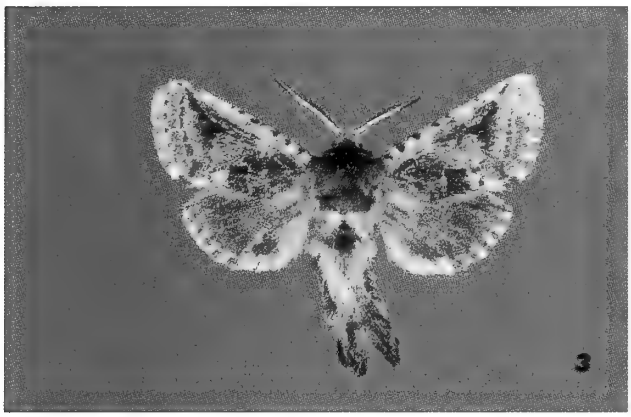
Figure. 22a. Wing venation of:*Arbelodes kruegeri* spec. nov., male, holotype; 23a. *Arbelodes heringi* (Janse, 1930), male, holotype; 24a. *Arbelodes dupreezi* spec. nov., male, holotype.

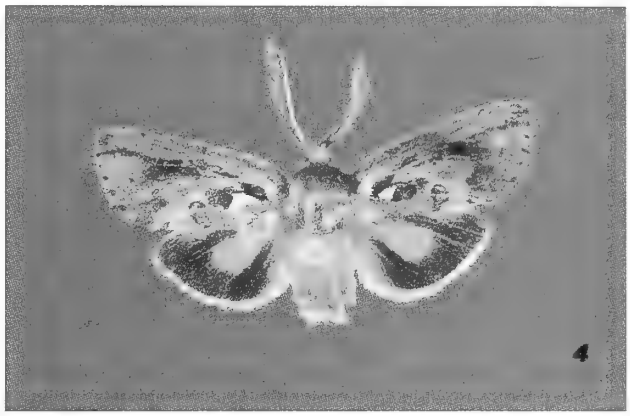
Figure. 22b. Genitalia of: *Arbelodes kruegeri* spec. nov., male, holotype; 23b. *Arbelodes heringi*(Janse, 1930), male, holotype; 24b. *Arbelodes dupreezi* spec. nov., male, holotype.

PLATE 1 - 5









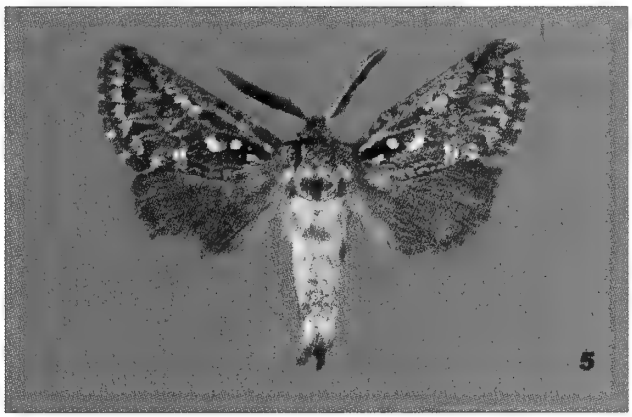


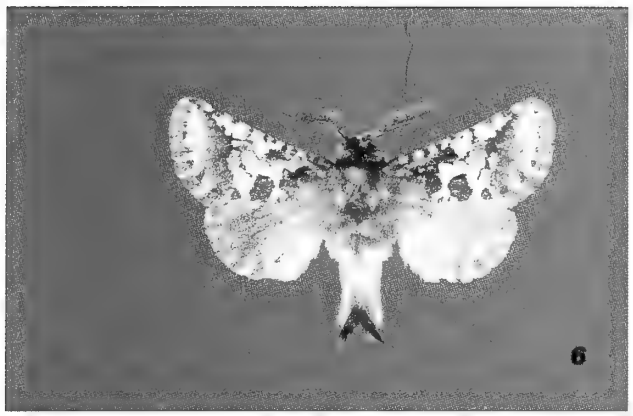
Fig. 1. *Arbelodes meridialis* Karsch (1896), male, South Africa, Eastern Cape Province, Steynsburg.

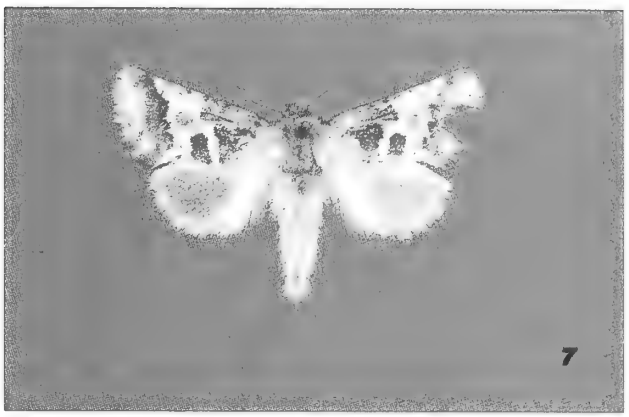
Fig. 2. *Arbelodes meridialis* Karsch (1896), female, South Africa, KwaZulu-Natal.

Fig. 3. *Arbelodes sticticosta* (Hampson, 1910), male, South Africa, KwaZulu-Natal, Balgowan.

Fig. 4. *Arbelodes flavicolor* (Janse, 1925), male, holotype, South Africa, KwaZulu-Natal, Impetyeni Forest.

Fig. 5. *Arbelodes deprinsi* spec. nov., male, holotype, South Africa, KwaZulu-Natal, Dragon Peaks Park.





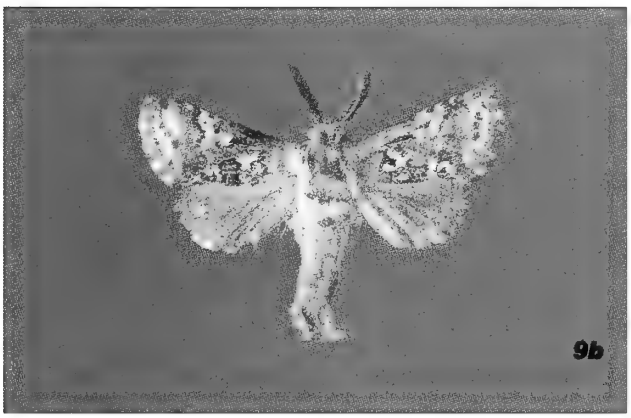


Fig. 6. *Arbelodes albitorquata* (Hampson, 1910), male, South Africa, KwaZulu-Natal, Coleford Nature Reserve.

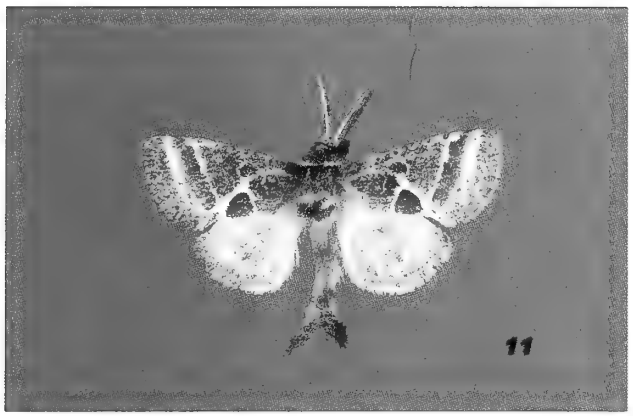
Fig. 7. *Arbelodes albitorquata* (Hampson, 1910), female, South Africa, Eastern Cape Province, Farm Onbedacht.

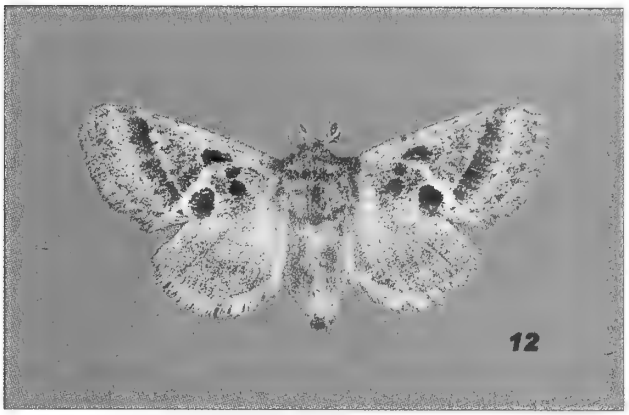
Fig. 8. *Arbelodes collaris* Aurivillius (1921), male, co-type, South Africa, Limpopo Province, Potgietersrus.

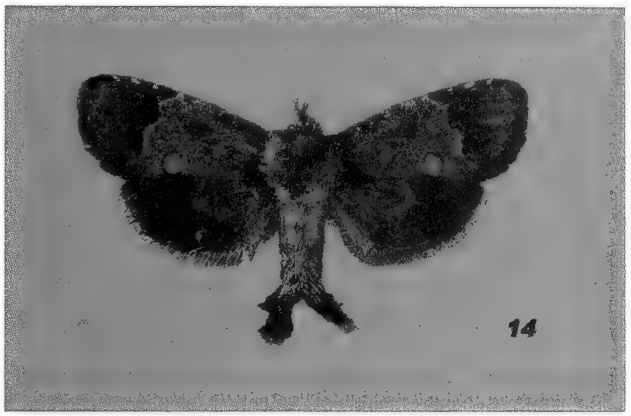
Fig. 9a. *Arbelodes prochesi* spec. nov., male, holotype, Zambia, Southern Province, Kalomo.

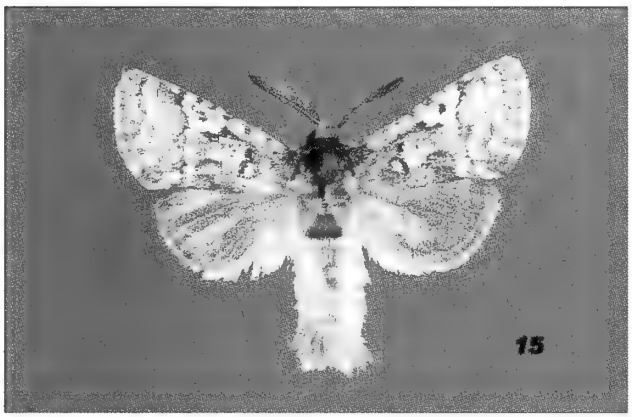
Fig. 9b. *Arbelodes prochesi* spec. nov., male, paratype, Zimbabwe, Vumba Highlands, Umtali.

Fig. 10. *Arbelodes sebelensis* spec. nov., female, holotype, Botswana, Bakgatla, Sebele.









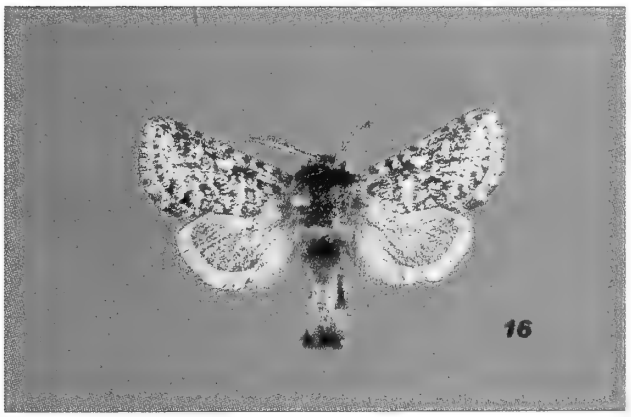


Fig. 11. *Arbelodes claudiae* spec. nov., male, holotype, Malawi, Mzuzu, Nkhorongo.

Fig. 12. *Arbelodes claudiae* spec. nov., female, paratype, Malawi, Nyika Plateau, *Juniperus* forest.

Fig. 13. *Arbelodes griseata* (Janse, 1925), male, South Africa, North West Province, Rustenburg Natuurreservaat.

Fig. 14. *Arbelodes mondeensis* spec. nov., male, paratype, South Africa, Eastern Cape Province, Kleinemonde.

Fig. 15. *Arbelodes iridescens* (Janse, 1925), male, South Africa, Gauteng Province, Pretoria.

Fig. 16. *Arbelodes haberlandorum* spec. nov., male, holotype, South Africa, Western Cape Province, Cederberg, Rondegat.

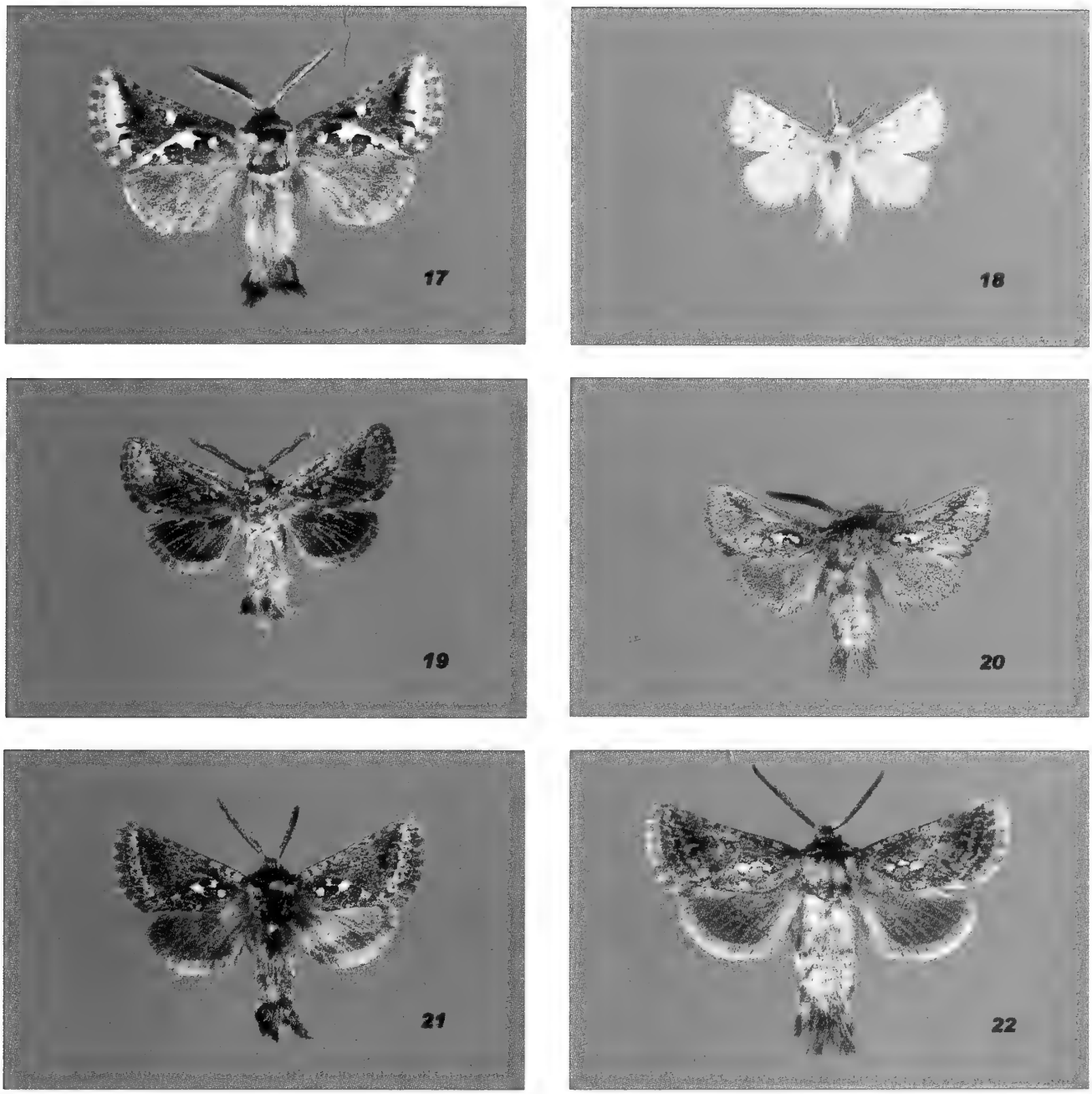


Fig. 17. *Arbelodes shimonii* spec. nov., male, holotype, South Africa, Western Cape Province, Cederberg, Rondegat.

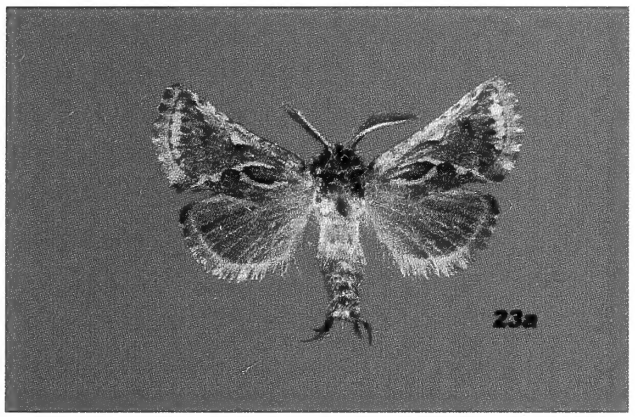
Fig. 18. *Arbelodes dicksoni* spec. nov., male, holotype, South Africa, Western Cape Province, Cape Town.

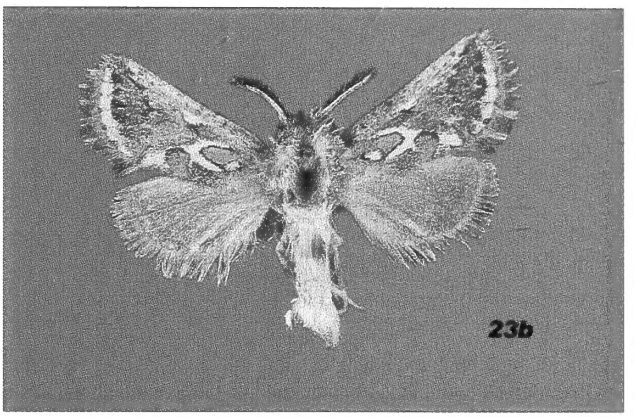
Fig. 19. *Arbelodes varii* spec. nov., male, holotype, South Africa, Western Cape Province, Bloubergstrand.

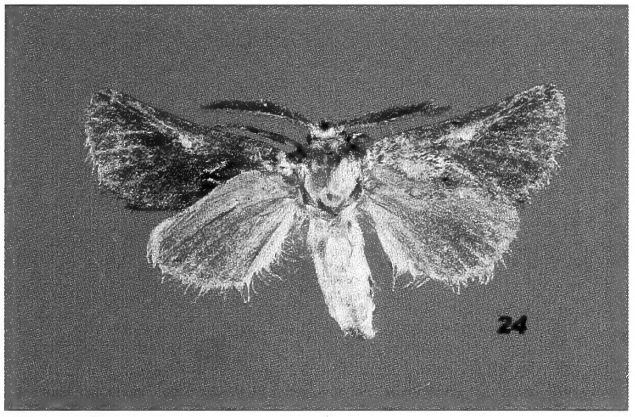
Fig. 20. *Arbelodes franziskae* spec. nov., male, holotype, South Africa, Western Cape Province, Cederberg, Rondegat.

Fig. 21. *Arbelodes agassizi* spec. nov., male, holotype, South Africa, Western Cape Province, Cederberg, Rondegat.

Fig. 22. *Arbelodes kruegeri* spec. nov., male, holotype, South Africa, Western Cape Province, Cederberg, Rondegat.







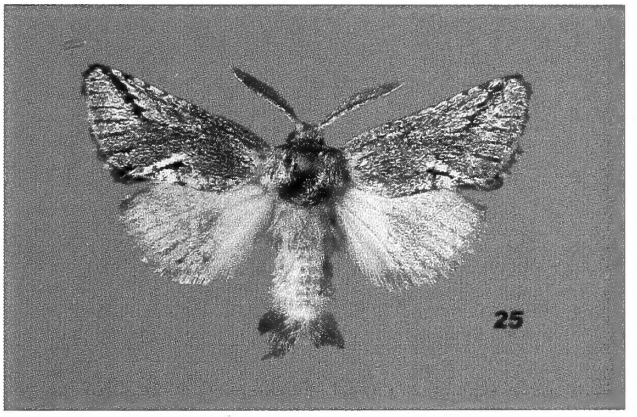


Fig. 23a. *Arbelodes heringi* (Janse, 1930), male, holotype, Namibia, Khomas Hochland, Windhoek.

Fig. 23b. *Arbelodes heringi* (Janse, 1930), male, Namibia, Khomas Hochland, Windhoek.

Fig. 24. *Arbelodes dupreezi* spec. nov., male, holotype, Namibia, Huib-Hoch Plateau, Farm Aar.

Fig. 25. *Arbelodes kroonae* Lehmann (2007), male, paratype, Namibia, Ai-Ais National Park, Gondwana Canyon Lodge.